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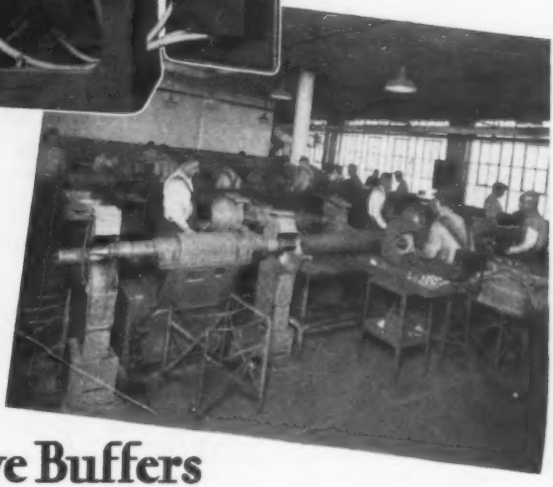

21

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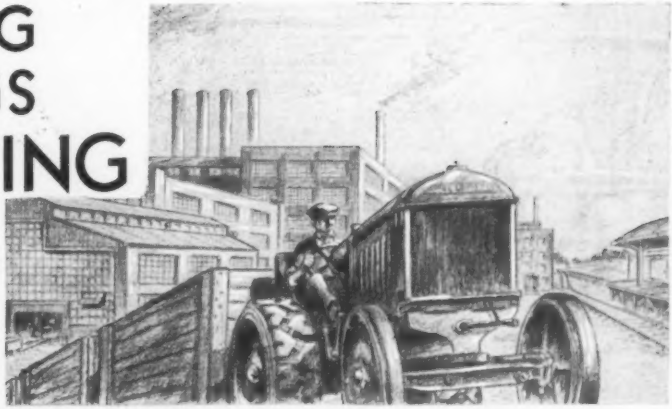

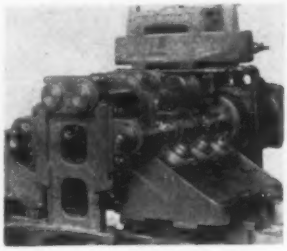

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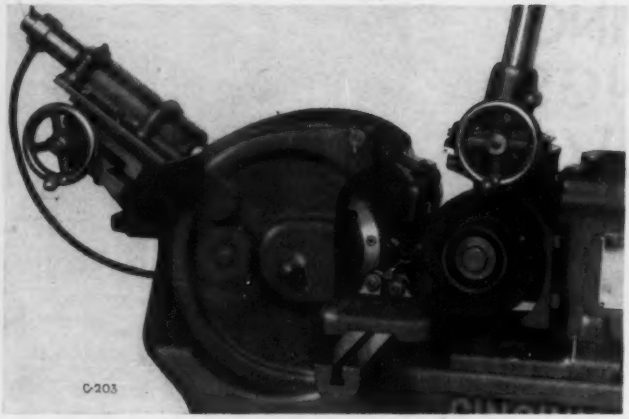

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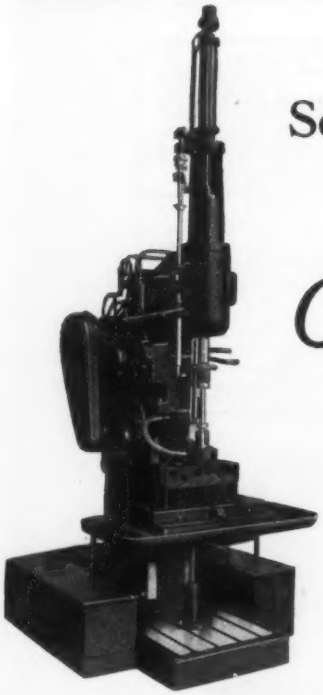

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Vol. 2 FEBRUARY, 1930 No. 9

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MODERN Machine Shop

FEBRUARY, 1930

CINCINNATI, OHIO VOL. 2, NO. 9

Welding Locomotive Parts With the Electric Arc

By JAS. M. VOSSLER
Welding Instructor, Southern Pacific Lines, Houston, Texas.

OF the various methods of autogeneous welding, the electric arc process is, in the large majority of cases, the most economical for use either in repairing broken locomotive frames, or in welding in new sections to provide for such changes in design as might be required for the application of a locomotive booster or introduction of a new section to replace an old, crystallized section. The process is not difficult, but there are certain precautions that must be taken if positive success is to be assured. All too often, in order to save time, proper procedure is not followed, and the weld is a failure. This, as is self-evident, is not a failure of the process, but is chargeable either to the operator or to careless supervision.

The different steps of the welding operation are as follows: (1) Proper preparation; (2) Proper welding procedure; (3) Proper after or heat treatment of the weld. If the object of the weld is to repair a broken frame, the preparation must include the determination of the actual cause of the fracture, and likewise must cover the removal of the cause. The removal of the cause generally calls for repairs to the locomotive. Following is a partial list of common causes of frame failure:

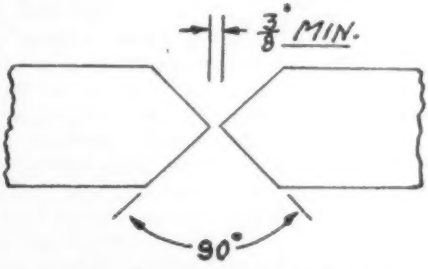


Fig. 1—The break should be chipped to a 90-degree angle for welding.

1. Pounding driving boxes and rods.
2. Furnace bearers worn beyond the limit.
3. Broken or working binders.
4. Improper counterbalance of driving wheels.
5. Frames loose, and working in

cylinder castings.

6. Frame braces loose and working.

7. Driving box striking top of frame jaw.

8. Equilizer or spring stands loose and working.

9. Defects in frame castings.

Among other causes of frame failure will be found what is generally known as "crystallization." Locomotives which have been converted from the saturated-steam type to the type equipped with apparatus for superheating the steam, in order to increase their rating, often give frame trouble due to the fact that the frames are loaded beyond the capacity for which they were designed. The usual remedy for these latter causes consists in the application of new frames. If, however, the trouble is confined to a certain section of the frame, the application of a new and reinforced section may be adequate, rendering the replacement of the entire frame unnecessary.

After the cause of the frame break has been determined, the break should be examined to determine what preparation is necessary to properly make the weld. Any locomotive parts that interfere with either the lining up or expansion of the frame at the break or the welding operation should be removed. The welder should never be required to reach through the spokes of a wheel to make a frame weld, as a good weld cannot be made in this manner.

Jacks should be placed beneath the frame to support it properly and to prevent any strain from interfering with the proper alignment of the frame, also to assure the frame staying in alignment during the welding operation. After the frame has been properly lined up, it should be trammed across the break, with the tram held parallel to the broken section. The tram marks should be made deep enough so that they can be easily located. It is good practice to place a square or triangle around the tram points with light chisel marks, so that they can easily be located.

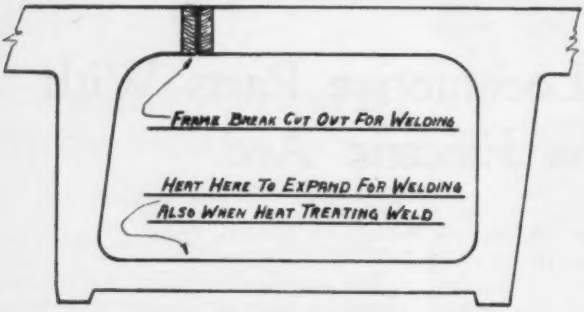


Fig. 2—It may be necessary to expand the frame by heating an opposing member.

The angle of opening of the cut that is made into the frame at the break in preparation for welding is very important. Practical experience has shown that in order to secure uniform success, the angle should be forty-five degrees with the center line of section of frame that is to be welded, or a total angle of opening of ninety degrees, as shown in Fig. 1. In order to prevent warping, the weld should always be made from both sides. This calls for a double vee cut into the frame.

The opening in the frame at the apex of the vees should be not less than one-quarter inch. If the frame metal at the break contains flaws, or is thought to be crystallized, the defective portion should be removed and a forging set in to replace the

defective metal. This, of course, will call for two welds instead of one. The cutting out of the break is done with an oxy-acetylene cutting torch. Care should be exercised to see that the sides of the cut are as smooth as possible. After the cutting is finished, all grease, oil or paint should be burned off all four surfaces of the frame with the gas torch to a

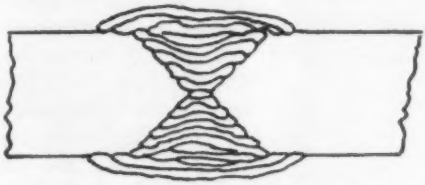


Fig. 3—Cross-section of weld, showing how metal is lapped.

distance of not less than two inches from the edges of the cut.

The scale left by the cutting torch must be removed before welding is started. The use of a sand blast should, however, be avoided, since it is very difficult to remove all of the sand from the surface of the soft steel of the frame by brushing, especially if the sand is sharp. Etching has shown that electric welding on sand blasted steel contains small blow-holes, while, when the scale was removed by other methods, the blow-holes were absent. The sand, also, might lodge in some of the many bearings about the locomotive, and cause considerable damage. It has been found best to remove the scale with a chisel, applied with a small pneumatic scaling hammer. Care must be exercised not to cut up the surface of the metal, and if the chisel is applied lightly this will be avoided. The use of a scaling tool having a heavy knurled surface is not recommended, since it has a tendency to beat the scale into the frame, rather than to remove it.

In order to allow for contraction during cooling after welding, the frame must be expanded or opened at the cut before welding is started. The amount of this opening will vary from $\frac{1}{16}$ in. to $\frac{1}{8}$ in., depending upon the size of the frame and the size of the welding rod used. On the small frame welds, and where $\frac{5}{16}$-in. welding rod is used, $\frac{1}{16}$ in. will generally be found to be sufficient, but on the average size frame, and especially where $\frac{3}{16}$-in. welding rod is used, a full $\frac{3}{32}$ in. will generally be found to be correct. Naturally the amount that the points of the cut are forced apart must equal the amount of expansion desired, less the amount the break was standing open before it was trammed. For example, if the break was standing open $\frac{3}{32}$ in. and it is desired that the frame be opened or expanded $\frac{1}{8}$ in. when welding is started, it would only be necessary to open the frame $\frac{1}{16}$ in.

There are several ways of expanding a frame for welding, the usual methods involving the use of jacks or wedges or the heating of an opposing section of the frame. If a jack is used, it is placed between members of the frame in such position that it will force the cut open. For example, if the break is in the top rail, the jack is placed between the jaw pedestals in front and rear of the break. If the frame cannot be expanded by this method, then a wedge should be driven into the cut. In this case it will be necessary to trim off the points of the cut so as to prevent the wedge from slipping sideways and throwing the frame out of line.

Sometimes it is necessary to use both the wedge and the jack, but there are times when neither one nor both will properly expand the frame.

In such a case an opposing member of the frame is heated, as shown in Fig. 2, with an oil torch. (If an oil torch is not available, a small charcoal fire can be used.) When the oil torch is used, a loosely constructed brick furnace must be built around the frame, similar to that used in straightening a bent locomotive frame. During the heating process the break must be gauged frequently with the tram to prevent the frame from expanding too much. It has been found best to use this latter method when welds are made in the erecting shop. It is not only quicker, but "straight line expansion" is secured.

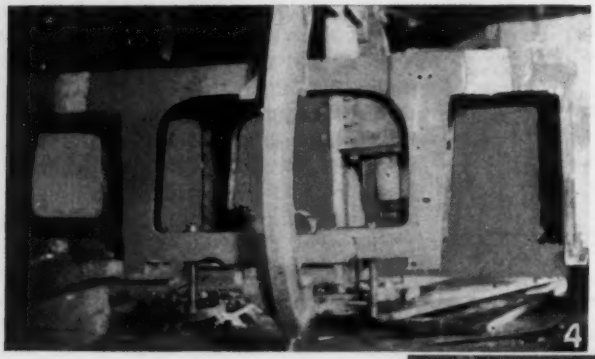
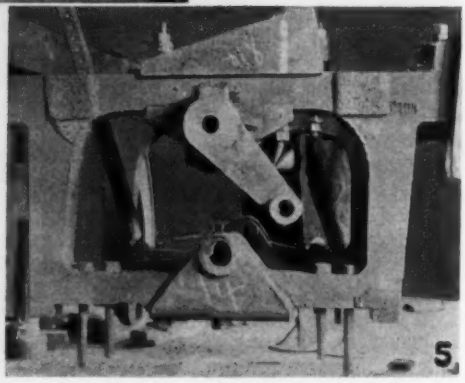


Fig. 4—Frame section after welding, with braces in place. This section replaced a similar section which had become defective. Fig. 5—A new top rail was welded into this frame, saving the expense of a new frame.



As soon as the frame has expanded to the proper point the fire must be withdrawn and the welding operation must be started at once—before the heat is lost. Before starting to weld, however, the frame should be checked at the weld location to see whether or not the expansion operation has thrown it out of line; if so, necessary correction should be made.

The weld should be made entirely of electrically-deposited metal. Experience has shown that the welding of plates or rods inside or outside of a frame weld is bad practice, and has a tendency to cause the welder to become careless with his work. It was formerly thought best to place a piece of boiler plate beneath a frame weld to aid the welder in placing the first beads of deposited metal of each layer, but this practice has, on the contrary, proved to be a detriment to the welder. It is a detriment in that after the layers of metal are scaled, it is difficult to brush this scale from the plate. It may further be added that if the welder is not capable of starting his layers without the aid of a plate, he is not competent to make the frame weld and should not be used on such work.

The selection of the proper electrode or welding rod is very important. Although there are many

brands of welding rods on the market, a large number of them have been found to be generally unsatisfactory for this work. The welding characteristics of the rod must be absolutely uniform, and a rod which is not absolutely uniform should be rejected. The quality of the rod has as much to do with the success of the weld as has the ability of the welder. The so-called fast-flowing rods are, as a rule, unsatisfactory. The rod should be one that can be easily controlled in the arc, and that will secure a good, even penetration. The chemical analysis of the rod should conform to the American Welding Society's specification E-No. 18. Too much care cannot be exercised in the selection of the proper rod. As to size, $\frac{1}{8}$ or $\frac{5}{32}$ in. rods have been found to be the best.

Fig. 6—Locomotive frame with section cut away so that a booster can be applied.

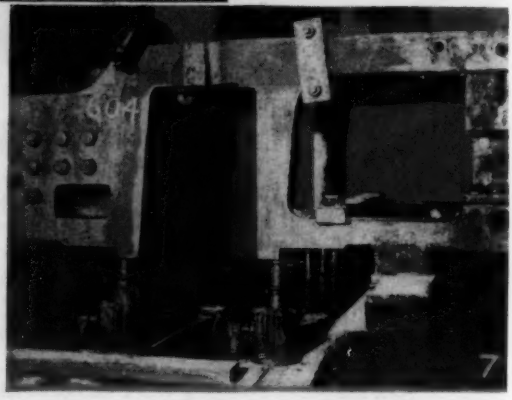
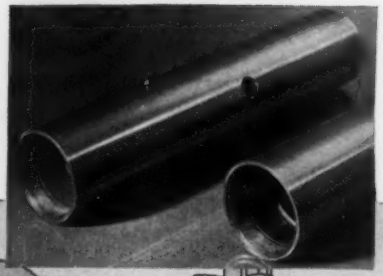


Fig. 7—New section in place for welding.

In starting a weld the welder should, naturally, start at the bottom, and first bridge the gap at the apex of the vees cut into the frame. If it has been necessary to cut this gap too wide for bridging with the deposited metal only, a mild steel rod of proper diameter should be placed in this gap. The size of the rod should be such that there will be a space left between the rod and the frame about equal to diameter of the welding rod used. When the bridging of the center is completed, the deposited metal should be thoroughly scaled with a chisel, applied with a small pneumatic scaling hammer, and every particle of scale should be removed.

Again the welder should start at the bottom and place a vertical layer of metal on one side. The layer should be between $\frac{1}{4}$ in. and $\frac{5}{16}$ in. thick, and composed of well-formed horizontal beads of deposited metal. In order to secure a proper weld to the parent metal of the frame, these beads should lap from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. on the frame metal, as shown in Fig. 3. When this layer of metal is



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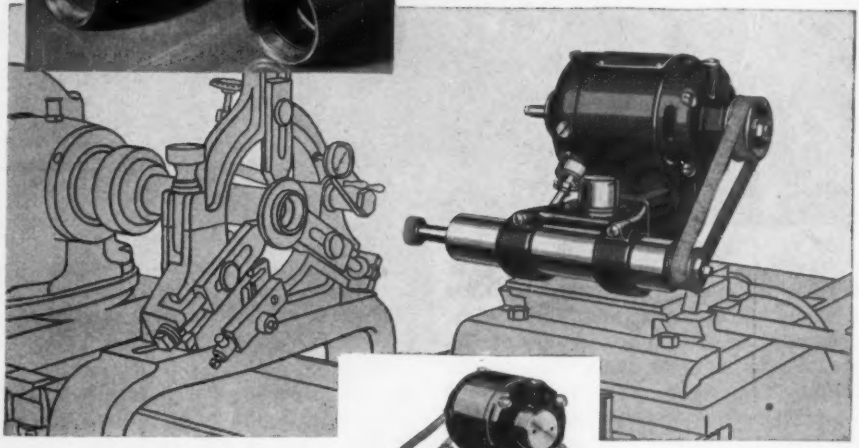

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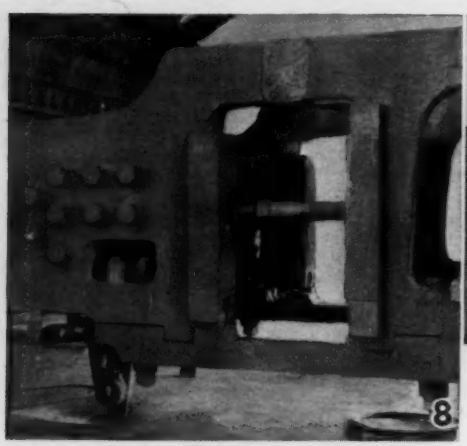

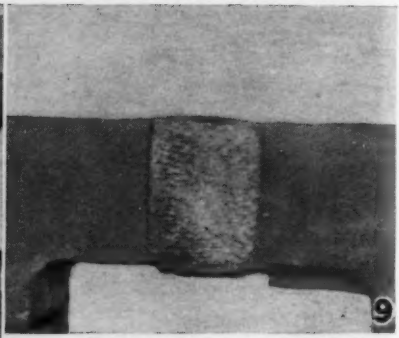

Fig. 8 — Frame after welding operation has been completed. Fig. 9—Close-up view of weld.

completed, it should be thoroughly scaled, as mentioned above, and then a layer of metal should likewise be deposited on the opposite side of the frame. In order to avoid warping the frame, the layers should be placed alternately first on one side and then on the other, until the weld is completed.

In Fig. 3 it will be noted that by lapping the successive layers on the frame metal, as described above, the weld will be found to be concave when the ends of the layers have reached the outer surface of the frame. Short layers must then be applied until the weld is brought flush with the outside of the frame.

As to reinforcement, a properly-made frame weld needs very little. A maximum of $\frac{3}{8}$ in. to $\frac{1}{2}$ in. on each side and one layer on top and bottom is sufficient. Each layer of reinforcement on the sides should overlap the ends of the preceding layer by about $\frac{1}{2}$ in. This will cause the reinforcement to taper off to the frame metal, and not end abruptly. The extra layer of metal on top and bottom of the weld should not be neglected, especially on the bottom, as it seals such small defects as may be accidentally left by the layers. It also gives a better appearance to the weld.

The writer wishes to lay stress on the cleaning of the scale from the respective layers of deposited metal. If the scale is not removed, it will interfere with the proper depositing of the metal, and some of the scale will be enclosed. This enclosed scale will cause a weakness in the weld.

After the weld is completed, it should be enclosed in an improvised brick furnace, and heated to a medium cherry red heat. After this heat has been reached, the fire should be reduced sufficiently to prevent further increase in temperature, and held on the frame long enough to permit the heat to soak through to the center of the weld. In order to prevent any possibility of upsetting the weld, a similar heat should be applied to the opposing member of the frame; that is, if the weld is in the top rail of the frame, an equal portion of the bottom rail should be heated and vice versa, so that the rails will be expanded equally. After sufficient time has been allowed for the heat to reach

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the center of the weld, the fire is withdrawn and the furnace closed so that the frame will cool slowly.

The object of thus heat-treating the weld, as described above, is to relieve the internal strains that are set up in the weld during the operation. An analysis of the operation shows that each layer of metal contracts upon cooling, and a tensile strain is set up within it. The contraction of each layer pulls against the preceding layers, until, when the outer layer is reached, the strain has reached considerable proportions. The center of the weld is then in compression. Being in compression, it will not carry its share of the load. Another thing that will be realized is that the strain in the top layers will be greater than in those at the bottom, due to the fact that the work of depositing the layers progresses from the bottom to the top. The heat treatment of the welds relieves these strains: however, if the precaution is not taken to see that the heated weld cools slowly and evenly throughout, strains will again be set up, due to too-rapid cooling.

The advantages of the heat treatment are clearly evident from the fact that prior to the starting of the heat treatment of the welds, about six per cent was lost, but since it was started, about three years ago, there is no record of a crack or break occurring in, or near, a heat-treated frame weld.

It might be well to state that, before the heat treatment was started, a weld would occasionally break thru the center and examination would disclose no cause. Nothing could be found wrong with the weld. It was finally noticed that these breaks started in the center of the upper edges. A study of these failures indicated that they were caused by internal strains. The elimination of the strains by heat treatment, as described above, put an end to these failures.

It is best always to place the beads in line with the strain in the frame member that is being welded, as the deposited metal is strongest in the direction of the length of the bead. Thus with a break in a vertical member, such as a jaw pedestal, the beads should be placed vertically in the layers.

Figure 4 illustrates a section of a frame of a Consolidation-type locomotive. The section between the center of the front jaw and the center of the intermediate jaw had become defective, due to crystallization. The balance of the frame, however, was in good condition. A corresponding section was cut from a second-hand frame, and welded in place. In order to hold it in line, it was clamped and braced to the other frame. Strips of one inch steel were welded across the top and sides of the cut in the top of the intermediate jaw to hold the frame in line at that point. After being expanded, the cut in the front jaw was welded as described above. After this weld had cooled, the strips were removed from the cut in the intermediate jaw with cutting torch and chisel. This cut was then welded. This frame has been in service a number of years since the introduction of the second-hand section, and has given no further trouble.

The frame section shown in Fig. 5 shows two welds made to apply a new top rail between the front and intermediate jaws, also in a Consolidation-type locomotive frame. By such methods as those described above, new frame-sections have been successfully applied to quite a number of locomotives, and the expense of new frames avoided.

When it was decided to equip a cer-

(Continued on page 38)

A PRODUCTION TOOL

In Every Sense of the Word!

THAT is the best way to describe the C-O Multiple Spindle Drill. It is constructed to give the highest degree of accuracy and speed—to meet the largest production demands. Individual motor drive provides for individual operation of each spindle at any speed. This is an exclusive feature of CANEDY-OTTO Motor Driven Drills.

The vertical mounting of the motors simplifies the power transmission problem. All idlers, pulleys, and twists and turns in belts are eliminated.

The machine is completely equipped ready for operation by attaching to a lamp socket. It is furnished in either 2, 3, 4 or 6 spindles, floor or bench type, in the following speeds: 400—850—1,750 R.P.M., 1,000—2,200—5,000 R.P.M., 525—1,400—3,000 R.P.M. and 3,400—5,600—10,000 R.P.M.

Catalog Number 50 fully describes this machine and the complete Canedy-Otto line—send the coupon for your copy TODAY!

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A Clerkless Cost System for the Small Shop

By WALDO HUTCHINSON

MUCH has been published regarding methods of handling orders and costs in a small manufacturing plant, but very little of this material has been presented in such form as to be readily duplicated by anyone interested, without the assistance of an expert systematizer or accountant. Recognizing the need for a comprehensive outline of a system which is practical for use in a small machine shop, or any kind of a small manufacturing business for that matter, details are here given of a system now in use in such a shop, showing the forms used and illustrating them by an actual case.

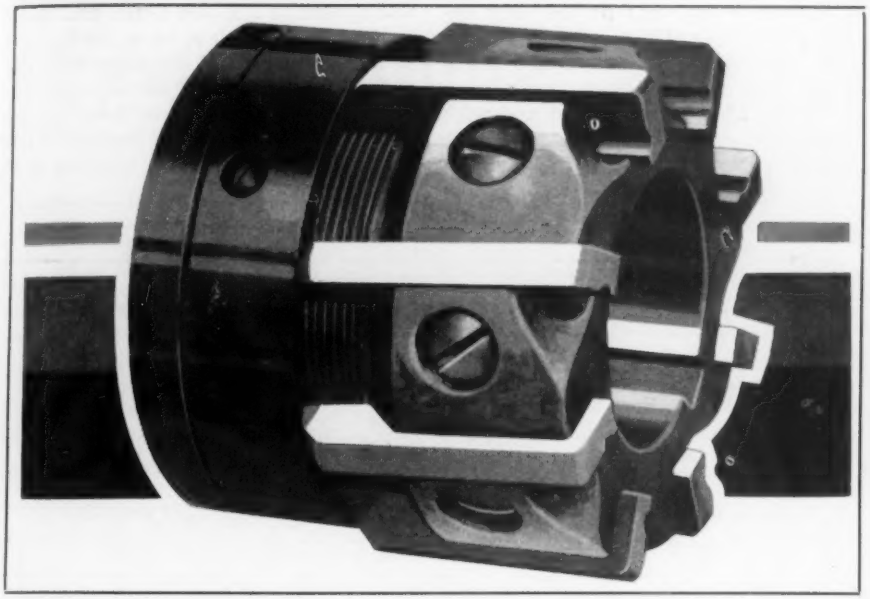
The object of this system is to enable the small shop owner to carry on his business in a simple, intelligent, systematic way, and, at the same time, to do it with the least possible amount of clerical labor—in fact, without any additional labor. It is the custom in the shop using this plan to have the work of keeping up this system done by the regular employees. The fact is that things run so much smoother in this plant since the inauguration of the system referred to in this article that the men who handle this work really have time to spare as a result of the improved conditions.

The shop in which these forms are used, does, primarily, a jobbing business. They are likely to be asked to do anything that can be done on a metal-working machine. The key men of the organization and their duties are outlined in Chart I. A time-recording clock has been installed, so that the storekeeper's time is not overtaxed by his extra duties in connection with the time records. Indeed, the use of this clock enables him to give considerable of his time to the clerk, who may be pressed with work at times.

The orders when received are made up by the clerk in triplicate, the original being used as the invoice, the

POSITIONS		DUTIES
OWNER		Salesman
Manager	Estimating	Designing
Office Man	Bookkeeper—Cost Clerk	Cashier
Storekeeper	Stockkeeper	Timekeeper
Foreman		Foreman

CHART I: Five men, indicated by the titles listed at the left on this chart, form the office, sales and supervisory force of the small factory where this system is in use. The duties assigned to each are listed at the right.



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THIS McCrosky-SUPER Shell Reamer is designed for line bar reaming. It has an extra large straight hole that permits the use of a large, sturdy bar. The compact over-all length accommodates the reamer to limited clearances. The reamer body is hardened to protect it from damage and wear. The blades are held rigidly in place by a simple and positive lock which works with and not against the cutting thrust. New blades can be readily inserted in the original body, renewing the life of the reamer and cutting the cost of accurately finished holes. These features are incorporated in nine other styles of standard McCrosky-SUPER Reamers that produce uniform holes with economy. Bulletin No. 11-A will give you details and show many installations of SUPER Reamers on definite jobs. Send for a copy.

McCrosky Tool Corporation, Meadville, Pa.

McCrosky-SUPER Adjustable Reamers

duplicate (Form III) as the shop order and the triplicate (Form VI) as the shipping memorandum. These forms are ordered from the printer in blocks already assembled and with holes perforated in them at the top so that they may be filed in loose-leaf binders. The office record book (Form I) may seem unnecessary to some, but it has proven quite valuable to the company referred to above.

The foreman of the shop is really the superintendent. He is provided with a large table equipped with pegs which take these forms. Thus he is able to classify and group his work and orders to suit his fancy and, also, he has before him a very good chart of the condition of his shop and the work that is passing through it. He is able to figure ahead on jobs for the men who are about to complete the jobs on which they are working and thus make a saving in productive time, since he does not have to keep men waiting at his desk while he determines what they shall do next.

Instead, he assigns a new job to each man immediately and, at the same time, hands the man a new time ticket (Form V). This time ticket is handed in by the workman each

Form I **OFFICE RECORD BOOK**

Customer	Order No.	Description of Work		Date of Our Shop Order	Wanted	Completed
		Quantity	Operation			

Form II **MATERIAL ORDER**

Order No. .....

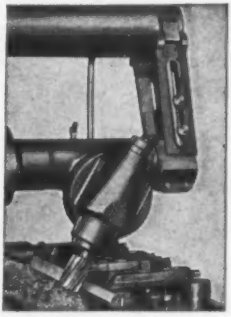
STOREKEEPER:

Deliver the following to Workman No.....

Amount	Description	POUNDS	
		Unit weight	Total weight

Faster Milling

No. 3 model milling oil grooves 5⅝" long close up to shoulder, using ¼" end mill on extension. Time, 3 minutes. This job is almost impossible without a PORTER-CABLE Universal Attachment, as cutter had to get under 30° flange.



Rough milling 30° angle on No. 2 Maxel Steel ⅝" thick, 17¼" long. Heavy-Du-T Model using 1½" high speed cutter.

ONE user of Porter-Cable Milling Attachments feels that they are "well-nigh indispensable." It only takes three minutes to attach to any standard miller and then it can be operated at any angle—in any plane.

Consider, too, the time saved in reduced set-ups—it costs less to move the cutter than the work.

Increased capacity, too—because intricate jobs formerly done by hand can be accomplished on the miller.

Made for hand and power feeds—five sizes, one for every need. Let us show you what Porter-Cable Milling Attachments have accomplished for many concerns. Write us now.

THE PORTER-CABLE MACHINE CO.
300 WOLF STREET SYRACUSE, NEW YORK

PORTER-CABLE
PORTER-CABLE MACHINE COMPANY OF SYRACUSE, NEW YORK

3655

Form III **SHOP ORDER**

Our Order No.....Dated..... Customer's Order No.....

Name .....

Address .....

Ship .....

Quantity	Operation	Remarks

Wanted.....Workmen's No..... Foreman.....Inspected.....Checked.....

night and after being checked by the foreman in connection with his shop order, it is returned to the workman before noon the next day, so that he may add on his time for that day, providing that he is working on the same job.

As soon as the job is completed, or in some cases while it is in process, the clerk collects the time tickets and enters the labor information on his time and material record (Form IV). When it becomes necessary for the workman to draw stock to work with, he is required to present to the storekeeper a material order (Form II) which specifies what is wanted. The order must also bear his clock number. These material order forms are passed along to the clerk at the close of business each day and it is from these forms that he obtains the information for the material side of his cost record.

One of the secrets of the success of a system of this kind lies in keeping all records up to date and in not al-

(*Continued on page* 32)

Form IV **TIME AND MATERIAL RECORD**

Order No..... Date of Order.....

Covering.....

LABOR				MATERIAL				
Workman	Hours	Rate	Total	Description	Quantity	Weight	Price	Cost

MATERIAL TOTAL .....

LABOR TOTAL .....

BURDEN 13.4% .....

TOTAL LABOR ..... TOTAL COST .....

TOMKINS-JOHNSON

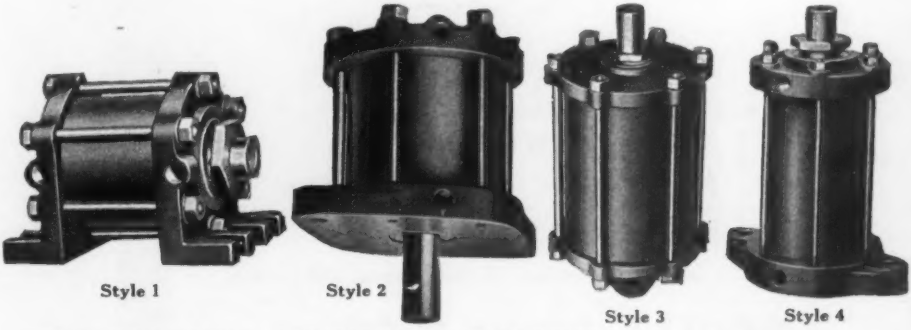
PNEUMATIC AIR CYLINDERS

(Tubular Type, Non-Rotating, Double-Acting)

EVERY machine depends absolutely on its tool for profitable operation. Give as serious consideration to your tool-buying as you do to your machine-buying!

"T-J" Equipment effects profitable economies, produces more and better work, and will prove its value *on trial.*

Get in touch with us today! Use the coupon! Our representative near you will prove helpful in solving your production problem.



Style 1 Style 2 Style 3 Style 4

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Address..... State.....

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"DRIVE BY THE FLAT"
"CENTER BY THE SHANK"

Reduce Your Drill Cost 25 to 50%
Save the Cost of the Taper Shank

Straight Shank Drills used with "SCULLY-JONES" Drill Chucks have every feature of Taper Shank Drills—

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3—Positive Drive
3—Runs Concentric

An inexpensive, one-piece Collet Chuck, HARDENED—machined to absolute accuracy.

Easily Set—Easily Removed—Requires No Screws or Wrenches

Because the Chuck is smaller than Spindle, "SCULLY-JONES" Chucks work as close in Multiple-Spindle Machines as the Spindles can be set.

You'll save money by sending in the coupon today.

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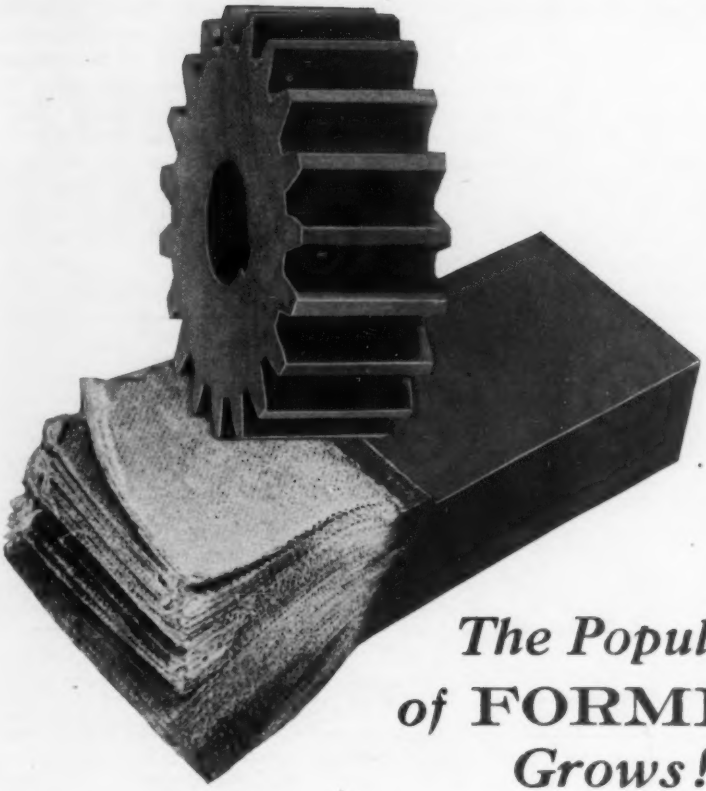
Kindly send copy of your Catalog No. 36 containing full details on your Drill Chucks, also on your other "WEAR-EVER" Production Tools.

NAME.....TITLE.....
FIRM.....
ADDRESS.....
CITY.....STATE.....



The Popularity of FORMICA *Grows!*

QUIET machinery is popular — and Formica gears, which make machinery quiet, constantly grow more popular with men in charge of maintenance.

Formica gears are also popular with machinery salesmen, because quiet machinery is easier to sell.

Every month more manufacturers adopt Formica as standard equipment.

Gear cutters in all parts of the country carry Formica sheets in stock from which blanks of various diameters can be cut and gears delivered very promptly.

THE FORMICA INSULATION COMPANY

4632 SPRING GROVE AVENUE CINCINNATI, OHIO

FORMICA

A Clerkless Cost System

(*Continued from page 28*)

lowing these slips to pile up to be entered at the end of the week or the month. They must be entered daily. When the records are kept in this way they are valuable to the foreman in checking up the individual performances of his men and they are also of prime value to the estimator in figuring on similar jobs, since they give him a real idea of what the machines in that shop are actually capable of doing, thus enabling him to estimate and price more closely. When jobs are running much alike, it is advisable in some instances to omit the continual repetition of the cost and material record.

The storekeeper has a record book similar to that kept in the office, and illustrated by Form I, in which he notes briefly just what is shipped each day, giving the numbers of the orders. This book is sent to the clerk at a certain time each day. The clerk looks it over and checks his order records, thus obtaining an idea as to just what is going on in the shop at all times. This book, it will be seen, fills the gap left in most systems. Once an order is placed in the shop, the originator may never hear of it again unless the customer causes him to make some sort of an investigation for one reason or another.

The stock record (Form VII) is kept with the material that it covers, thus leaving no excuse for its not being kept up properly. The storekeeper is expected to enter all withdrawals at once and to balance the sheet each day.

Now we will suppose that it becomes necessary to investigate a certain order for a customer. For example, Mr. Abbott might ask when he could get some of the castings per drawing P-236 called for on his order number 427. Upon receipt of the inquiry, the cashier would look in his office record book (Form I) to get the shop order number, which in this case is number 123. Having the order number, the foreman has no trouble in locating his copy (Form III), providing he has the work in process. If he has, then he gets from it the number of the workmen; namely, 937, 938 and 939, and is then in a position to determine the status of the job in a very short time and whether or not it is possible to rush the order any.

Form V **TIME SLIP**

Order No. ..... Workman's No. .....

Date	Hours	Description of Work	DATE Started	DATE Completed

TOTAL HOURS.....

Approved.....
Foreman.

Form VII **STOCK RECORD**

Reorder in quantities not to exceed ..... when balance on hand falls below .....

Part Number .....

Name .....

IN		OUT		BALANCE		
Date	Quantity	Date	Quantity	Charged to Order No.	Balance	Date

The primary advantage of this simple system is that the clerical work is well distributed and is considered by each of the persons involved as a routine duty which must be kept up to date and persistently followed each day. The men perform this duty like clockwork and with enthusiasm. The importance of keeping before all involved the necessity of thus treating their individual parts of the work as routine duties cannot be too strongly emphasized.

The system is flexible and can be made to apply to a shop employing one hundred men, with very little increase in the clerical expense. The forms are very simple and comparatively cheap, and the system as a whole is one that can be installed without much trouble by any manufacturer who recognizes that it is better adapted to the conditions under which he is working than are the methods he is using at the present time.

To those who may wish to adapt

(*Continued on page 38*)

Form VI **SHIPPING MEMORANDUM**

Our Order No..... Date..... Your Order No.....

Name .....

Address .....

Ship..... No. of Packages.....

Quantity	Operation	Remarks

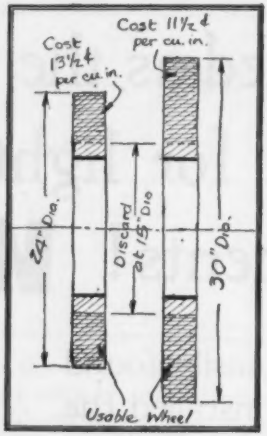
WEIGHTS: Gross..... ..... Net.....

LITTLE LESSONS IN GRINDING COSTS

THE Superintendent, Tom Carson, looked up from the cost charts he had been studying.

"Mr. Vance," he said to his caller, "You know, for the life of me I can't understand why those 30 inch wheels of yours made such a remarkable showing in that test. It doesn't seem reasonable."

"Well, sir," Bill Vance replied, "I've seen it happen so often that I'm not surprised at all. That's why I recommended those large diameter wheels to you. In fact, the SAFETY Grinding Wheel Company has always been known as an advocate of big wheels—because we have seen so many examples of their economy.



ECONOMY OF LARGE WHEELS

"There are several reasons why the large diameter wheels are more economical. In the first place, they cost less per cu. in. of abrasive material. Take these 30 x 3 x 12" 'Safe-T-Bond' high-speed wheels you just ran the test on, for example. They list at $183.80. In running them down to 15 in. stubs you use up 1590 cu. in. of abrasive. That makes the unit cost 11½ cents per cu. in. A 24 x 3 x 12" wheel on the other hand, lists at $111.80, has only 827 cu. in. of useful grinding material and, therefore, costs 13½ cents per cu. in. The 30 in. wheel consequently shows a 15 per cent saving in cost of wheels alone."

"Well, that's clear enough," the Superintendent broke in, "But it doesn't entirely explain why these test results show a 30 per cent increase, instead of just the 15 per cent that you are talking about."

"That's right. It doesn't," Bill Vance replied. "The extra savings come about this way. . . ."

(To be continued)

* * * *

And if you, too, would like to know the full explanation of that surprising economy in the use of large wheels, the coupon below will bring you an advance proof of next month's ad, which completes the story. Fill in your name, pin the coupon to your letterhead and drop it in the mail. Why not do it now, while you are thinking about it?

Lubrication Under High Temperature Conditions

By W. F. SCHAEFER

SOME time ago a large concern which operates an enameling department found that the workmen in this department were having difficulties with moving oven trucks after they had stood in the ovens long enough for the enamel to bake on the freshly-enameled parts. It was apparent that the intense heat of the ovens was affecting the axle bearings, making the wheels stick so that it was difficult to roll the trucks out of the ovens.

In order to eliminate the difficulty, they equipped 500 trucks with special fittings which were intended to hold more lubricant. They found, however, that the high temperatures of the ovens still caused the lubricant to carbonize, and it was still next to impossible to turn the wheels. They then tried several different kinds of ordinary greases, without result. The problem was finally solved by removing the special fittings and using a high grade enameling conveyor oil, which is applied with a squirt can. This oil did not carbonize, and there is no more sticking of wheels.

I am writing this only to show that there is a difference in lubricants, and that the problem of lubrication is a very important one. Many times problems that are thought to be structural and complex, as in the above instance, are easily solved by the lubrication engineer.

Welding Locomotive Parts

(*Continued from page* 20)

tain number of Pacific type locomotives with boosters, it was found that it would be necessary to cut the frame in the top of the rear jaw and apply a new section from there back, so as to provide a section adapted to receiving the booster frame. These new sections were welded on by the electric arc process. Figure 6 shows the frame with the old section cut away, and Fig. 7 shows the new section in position for welding. At the top rail will be seen clamps holding a crosshead guide to the inside of the frame, to keep it in line for the starting of the weld. Figs. 8 and 9 show the completed weld. When locomotive frame welds are made as described above they not only will be successful, but will be found to be both economical and convenient.

A Clerkless Cost System

(*Continued from page* 34)

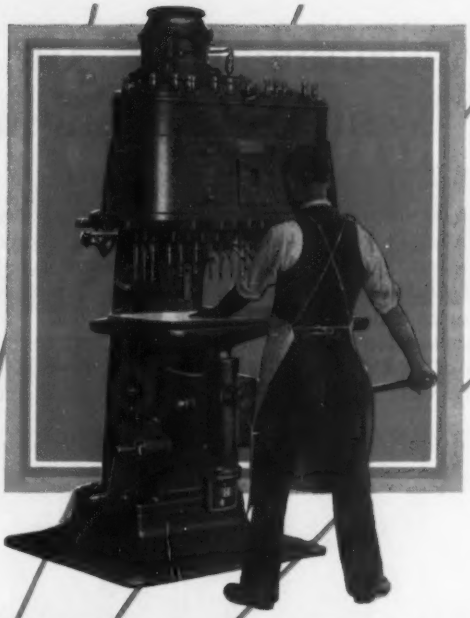
this system to their conditions the following tabulation may be of assistance:

Time and Material

Name of Form	Size	Paper	Color
Invoice	8½x11	Bond	White
Shop Order	8½x11	Bond	Pink
Shipping Memo	8½x11	Manilla	Yellow
Time Slip	5½x4¼	Manilla	Buff
Material Order	3 x 5	Card	White
Record	4 x 6	Card	Manilla
Stock Record	4 x 6	Card	Green

The colors given are merely suggestions, but they have worked out well in this case. A color scheme is, of course, of least importance with forms of different sizes, but the three eight and one-half by eleven forms, at least, should be of different colors and the two four by six cards should also differ.

The quality of paper best suited to the task has been considered in making up this specification list.



STANDARD NATCO HAND TABLE FEED MULTI-DRILLER

The Model C-7 Standard NATCO Adjustable Multiple Spindle Driller is a small machine arranged with a hand operated table feed. It has been designed by NATCO Engineers to meet the demand for a small Sensitive Adjustable Multi-Driller that will cover a large variety of small work. Write for a circular covering this machine or send in your blue prints for our Engineers' recommendations.

NATCO

SOLVES YOUR 'HOLE' PROBLEM

"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.

RICHMOND, INDIANA, U. S. A.

Machining Parts for Wright "Whirlwind" Engines, II.

By PHILIP WINTER

THE rear section of the crank case for the Wright "Whirlwind" Aviation Engine houses the accessory drives and supports the various engine accessories. Studs on the parting flange of this section receive the parting flanges of the diffuser and main section. The rear section carries the distribution chamber, which is formed between the rear wall of the diffuser section and the front wall of the rear section. Distribution chamber ports, tangential to the center line of the case, provide for the passage of the fuel mixture to the cylinder intake pipes.

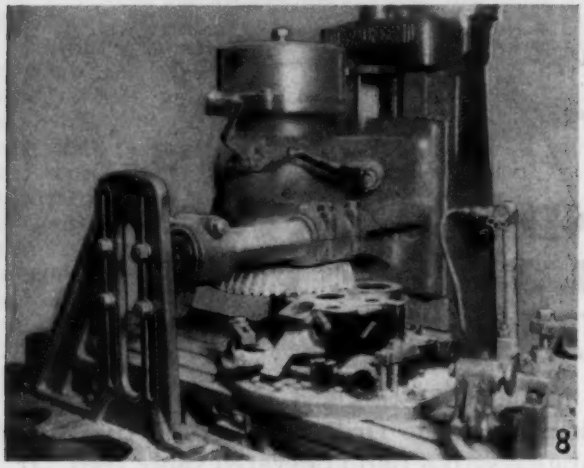


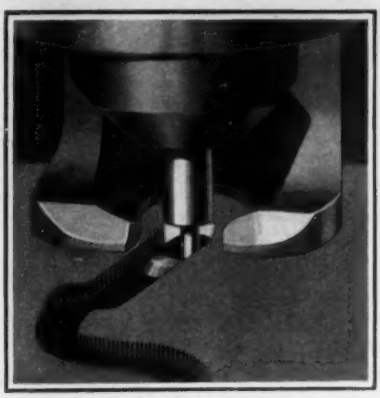
Fig. 8—The rear face of the rear crankcase section is machined on a "Mil-Waukee-Mil."

The first operation on this section is that of machining the rear face, which is performed on the Milwaukee milling machine shown in Fig. 8. The machine is equipped with a vertical milling attachment and a cutter large enough to finish the entire face in one cut. Approximately ⅛-in. of stock is removed, leaving an equivalent amount for finish on the opposite side of the piece.

The second operation consists in finishing the opposite, or front side of the casting, which is accomplished in a vertical boring mill as illustrated in Fig. 9. As the impeller draws the fuel mixture from the carburetor through this section of the case and thence to the distribution chamber, it is essential that the inner face of the casting, which forms the wall of the chamber, be finished accurate and smooth. The parting flange is first machined, then a roughing cut is taken across the face of the casting with a facing tool, held in the turret, as shown.

The finishing cut on the wall of the distribution chamber is taken with a form tool, shown in operation in Fig. 10. Two tapers are cut in this wall—a taper of 15 degrees at the outer edge, and a taper of 24 degrees in the center. As there is no provision for cutting such angles by machine feed, the tapers are obtained by means of a cam and roller, the cam being held

There is no faster or better method than *nibbling!*



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Experimental sheet metal work—duplication of blanks—and production work for parts requiring expensive dies can be done most economically on the Campbell Nibbling Machine.

40 times as fast as drilling

The rapid action punch "nibbles" a narrow lane at a rate of from 30 to 60 inches per minute, depending on the thickness of the stock.

Leaves a comparatively smooth edge

The edge left by "nibbling" is so smooth and true that very little finishing is required. For many purposes, no finishing whatever is required.

Submit your problems to us

Campbell Nibbling Machines are made in six sizes to handle stock up to 5/8 inches with various throat sizes to handle different types of work.

Let us help you with your sheet metal cutting problems. Address:

ANDREW C. CAMPBELL, Inc.
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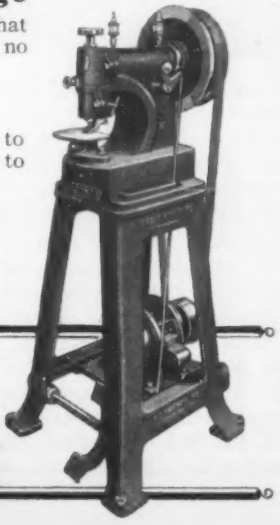
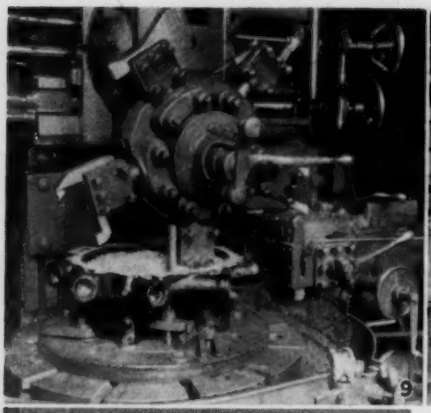
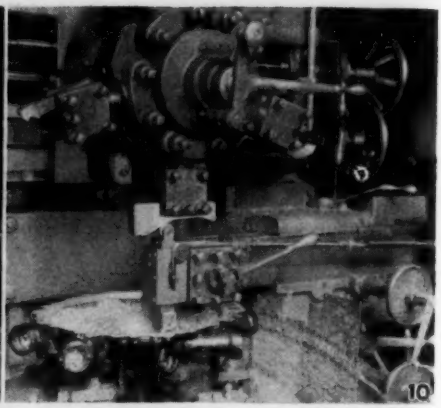


CAMPBELL
NIBBLING MACHINE





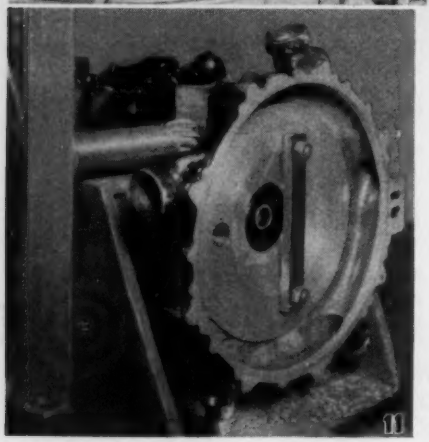


Fig. 9—Machining the front face of the rear section. This face forms the wall of the distribution chamber. Fig. 10—A cam and roller arrangement makes it possible to cut a taper in the face of the chamber. Fig. 11—Finishing the gun pads. A double fixture makes it possible to change pieces on one side while the other piece is in process.

in one of the turret tool posts and the roller being attached to the upper end of the tool holder. The tool is a ½-in. tool bit, clamped into the holder at an angle, as shown. The holder slides vertically in a box-like housing which is attached to the tool holder on the side arm, and is maintained in contact with the cam by means of a steel cable and spring, the cable being attached to a pin which is anchored in the holder and protrudes through a slot in the side of the housing. After the tool and cam have been properly set for the operation, the side arm feed is engaged and the cut is taken under power. A limit of ± .0015 inch is allowed from the face of the flange to the wall of the chamber.

Those who are not familiar with airplane engine construction will be interested to know that every engine built by manufacturers whose product has been approved by the U. S. Government is provided with machine gun mountings, known as "gun control pads." The pads are machined, ready for use, as a part of the regular production procedure. On the Wright engine the gun control pad is on the rear section, and is finished with a large end mill as shown in Fig. 11. As both ends of the pad are machined, a double fixture is used so that one end of the pad on one piece and the opposite end on another piece can be milled by simply moving the table over a few inches. The operator changes the pieces on one side of the fixture while the other piece is in process.

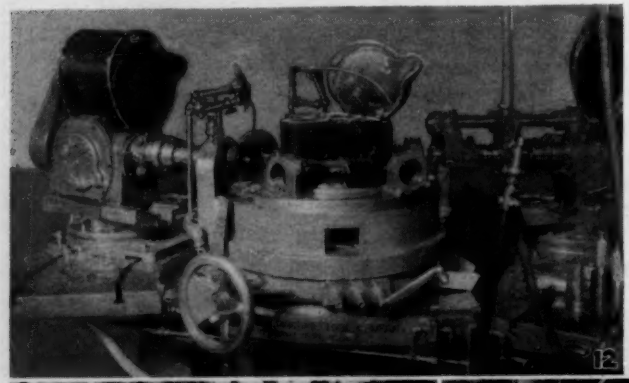
The distribution ports are rough bored, finish bored, and tapped in the Bradford 3-way machine shown in

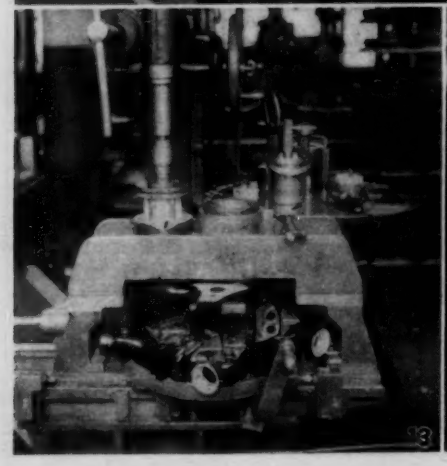
Fig. 12. In locating the piece on the table of the machine, it is placed over a clamping fixture which is so designed that the clamps can be operated to grip the piece from the inside and thus hold it securely in position. The boring tools and tap are driven by units which operate simultaneously and are controlled by a single lever. Each unit is, however, provided with individual control. The mechanism of the tapping unit includes a safety clutch which stops the feeding mechanism and spindle immediately if the tap jams, thus saving the tap and making it possible for the operator to continue this operation independently.

The holes for the starter motor and generator are finished with the equipment shown in Fig. 13. Here again a fixture is used with which the piece is clamped from the inside. The boring tool has two blades, which are set into the body of the tool in grooves with tapered bottoms, so that the blades can be expanded by means of an adjusting collar. The hole for the motor is held to a tolerance of .0005 inch, and the generator is held to .001 inch.

The rear section of the crankcase is assembled to the main section by twenty-four $\frac{7}{16}$-in. studs, for which

(*Continued on page* 48)





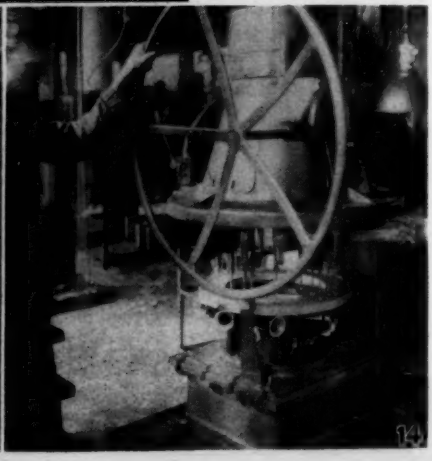


Fig. 12—Rough boring, finish boring, and tapping the distribution port holes. Three tools operate simultaneously on this Bradford. Fig. 13 — Boring the starter motor and generator holes. Fig. 14—Drilling the stud holes in the flange of the rear section.

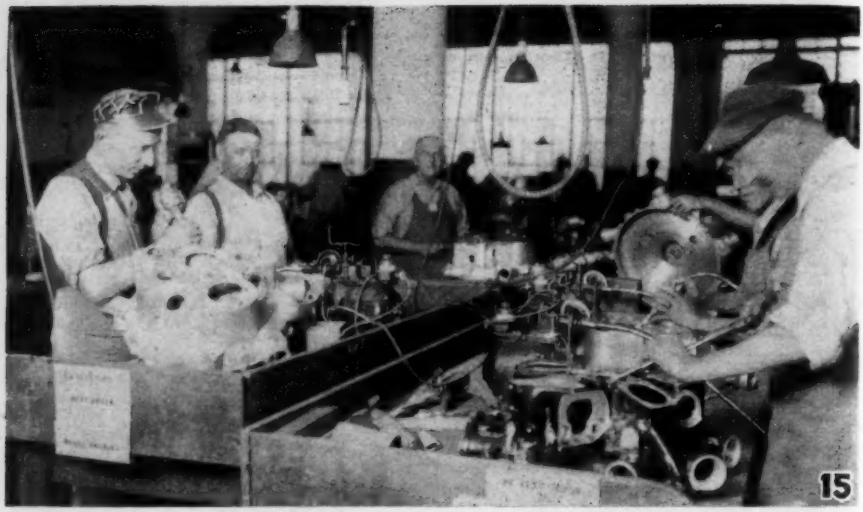


Fig. 15—All rough spots, sharp edges, and burrs are removed with the aid of these Strand flexible shaft machines.

Machining Wright Engine Parts

(*Continued from page* 44)

the holes, size "F," are drilled with the multiple drilling machine shown in Fig. 14. The piece is located by means of the starter motor hole, and is locked in position by three clamps.

The machines used in the operations referred to are arranged in consecutive order in a single line, so that the cases can be started at one end of the department and will be finished when they arrive at the other. After the last machine operation has been completed, the cases pass to the bench shown in Fig. 15, where they are given the finishing touches. Here the rough edges, burrs, and sharp corners are removed, most of the work being done with the aid of Strand flexible shaft machines which are used to operate small grinding wheels, burring tools, round files, and so on. A flexible shaft machine is supplied for each workman. When the cases leave this bench they are ready to be assembled to the motor.

Is High-Priced Oil Expensive?

By W. E. SCHAPHORST, M. E.

WHEN the smoke begins to roll up from a bearing, or when a shaft suddenly "freezes" in its bearings, stopping all production on that machine and necessitating a call for a repair man, usually some one gets raked over the coals—or worse—for failure to properly oil the bearings. Lack of oil is a bad thing, to be sure, and will invariably cause a bearing to heat, but a hot bearing is not always traceable to this cause.

Usually a buyer of any product gets just about what he pays for, and this

FOSDICK

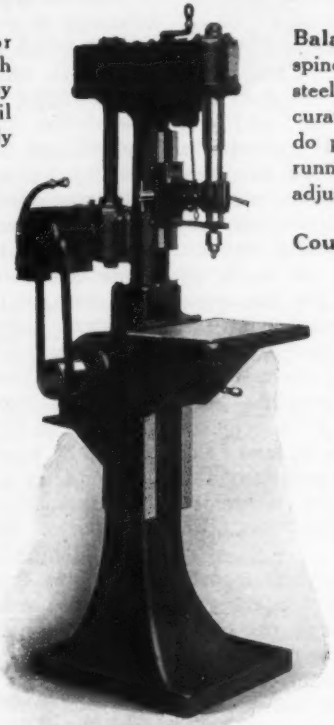
13" Superspeed Ball Bearing Sensitive Drill Will Reduce Your Drill Breakage

Ball Bearings for every journal. Each bearing protected by dirt-proof metal oil retainers and properly mounted.

Spiral Gear Drive. Spiral gears running in oil.

Running Parts Balanced. Every revolving member is balanced so that all vibration at high speeds is eliminated, and drill breakage is reduced to a minimum.

Speed Changes. The belt is shifted and speeds are changed by a single turn of the small handle on top. Belts can be replaced easily.



Balanced Spindle. The spindle is of high carbon steel, multiple splined, accurately ground, tested to do perfect alignment and running balance, and has adjustment to take up wear.

Counterbalanced Elevating Table. The elevating table is of the quick-acting counterbalanced type, with perfectly scraped slide gibbed to the pedestal. Handle at front of machine for clamping.

Counterbalanced Head. The head is gibbed to the doved-tailed slide on the column, and is counterbalanced to prevent dropping when unclamped.

Adjustable Feed Lever. The feed lever is adjustable to various positions for convenience of operation. A quick return star wheel enables the operator to feed, return, or position the drill rapidly with either hand.

If you are looking for ways and means to cut costs, ask for specifications and prices on this machine.

THE FOSDICK MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

is particularly true of lubricants. Large quantities of lubricating oils are purchased every day on a basis of price, and price alone. There are still a great many buyers, particularly purchasing agents, who have never become intimately acquainted with machine shop equipment and processes, who think that "oil is oil" and that one kind of oil is as good as another. When a high-pressure salesman says "Our oil is as good as——, and it only costs half as much," too often the sale is made. Then when complaints come in from the shop that bearings are running hot, and the buyer is faced with an increase in the cost of power required to overcome the additional friction, plus an unusually high machine repair expense, he learns that all oil is not oil.

Some oils cost twice as much as other oils that are sold for the same purpose, yet it is not unusual for the more expensive oil to last three or four times as long as the cheaper oils. The high grade oil requires less power, and of course with reduced friction, there is less wear and tear on the machinery. An analysis of the costs, balanced against the results obtained, will show that money has been saved all around.

Bearing clearances are very important. If the clearance in a bearing is either too small or too large, the bearing will heat. When the bearing is too large, there is greater pressure per square inch between the surfaces that are in contact, and an undue amount of heat will be generated. When a bearing is larger than the shaft, the point of contact between the shaft and the bearing is narrowed down and the shaft will cut through the oil film. As soon as this film is cut through, the metal surfaces form direct contact, which results in rapid wear and the usual "hot box."

On the other hand, if the clearance is too small, there will be no room for the oil to form a film all the way around the shaft and friction will cause the bearing to overheat very quickly. As the temperature of the bearing and shaft rises, the shaft will expand and when it is too large for the bearing, it will stick or "freeze" and no amount of power can turn it.

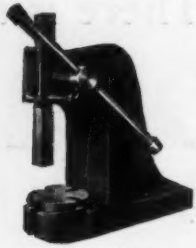
Alignment is also important. When a shaft is supported by several rigid bearings in a row, the bearings must be in perfect alignment, otherwise the shaft will bind against the edges of the bearings. This pressure will break the oil-film and an over-heated bearing will be the result. Even if the bearings are of the self-aligning type, a bearing that is out of line with the others will cause an undue amount of pressure to be developed, with the same results. Whether the bearings are plain, ball, roller, rigid, or self-aligning, they should be in perfect alignment, or trouble will ensue.

Another item that should be taken into consideration is dirt. Regardless of the kind of oil used, bearings should be kept clean. Dirt in a bearing sets up a resistance that cannot be offset by the highest-priced oil in the world. No oil should be used in any machine, unless it is known to be clean and free from foreign matter, especially grit.

Grinding Wheel Data

For fast cutting, grain sizes 24 to 46 usually are best, even though there was no objection to the finish from coarser sizes. For certain very hard steels it is well to go as fine as 60 grit for fast cutting. The reason probably is that the depth of penetration is limited by hardness of material. If a 46 grain cannot take a bigger chip than a 60 grain can, then we had better go to the 60 grit and have more cutting points per unit area of wheel face. —(Norton Company)

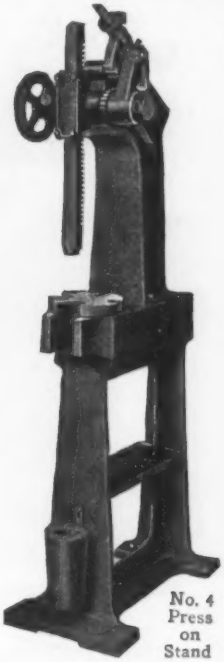
No. 1 Press



No. 2 Press

No. 3 Press

SHELDON Arbor Presses



No. 4 Press on Stand

DESCRIPTION—Sheldon Arbor Press frames are made of semi-steel, the metal being properly distributed, giving a light and exceptionally strong casting. Rams and pinions are made of alloy steel, heat-treated. Large stub tooth is used. Rams are square, carefully fitted, insuring proper alignment.

Nos. 1 and 2 presses are furnished only with plain levers. No. 3 presses are furnished either plain or ratchet levers. No. 4 presses only with compound levers.

Floor Stands can be furnished for our No. 3 and No. 4 presses. They are made of semi-steel, are well ribbed and of heavy construction. They are provided with removable shelves and wood pots for catching mandrels, tools, etc.

— SPECIFICATIONS AND PRICES —

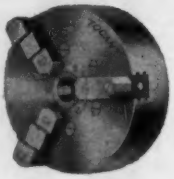
Ask for Complete Catalogue	No. 1 Press	No. 2 Press	No. 3P Press	No. 3R Press	No. 4 Press	No. 3 Floor Stand	No. 4 Floor Stand
Largest dia. will take.	7″	12″	16″	16″	20″		
Largest dia. mandrel..	1″	1⅝″	2½″	2½″	3″		
Height over plate....	4½″	8½″	14″	14″	18¼″		
Max. height will take.	5″	9½″	15″	15″	19½″		
Size of ram (square).	⅞″	1⅛″	1½″	1½″	1½″		
Length of ram.....	7¾″	13½″	21″	21″	26″		
Movement of ram....	5″	9¼″	15″	15″	20″		
Leverage.....	25 to 1	35 to 1	48 to 1	72 to 1	100 to 1		
Pressure on ram (tons)	¾	2	5	7½	10		
Height.....	9½″	17″	26″	26″	33½″	35″	30″
Dimensions of base...	4″x10″	6¼″x17″	8″x20″	8″x20″	8″x24″	14″x22″	14″x25″
Net weight.....	19 lbs.	75 lbs	150 lbs.	215 lbs.	320 lbs.	145 lbs.	185 lbs.
Weight crated.....	20 lbs.	85 lbs.	170 lbs.	240 lbs.	360 lbs.	150 lbs.	195 lbs.
Price, F.O.B. Chicago.	**$10.00**	**$20.00**	**$30.00**	**$40.00**	**$75.00**	**$20.00**	**$30.00**

No. 3-R Press

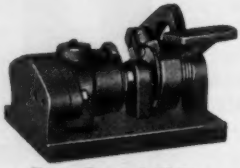
SHELDON MACHINE CO.

3251 COTTAGE GROVE AVE. CHICAGO, ILLINOIS

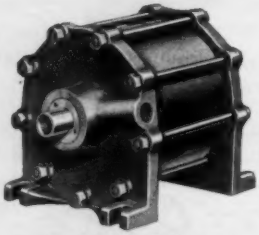
Hand Control Valve



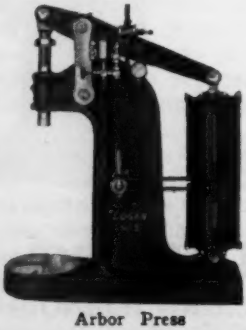
Three Jaw Chuck



Foot Control Valve



Model "B" Cylinder



Arbor Press

There is a "LOGAN" Air Operated Device for Your Requirements!

THE elimination of waste in time, effort and motion is a prime factor in Modern Industry. No device eliminates these factors as completely as LOGAN Air Chucks, Air Cylinders, Control Valves, etc.

These devices are designed for quick, positive action and an unyielding grip, when applied to work holding devices assures accuracy, uniformity, and increased production in the machining of duplicate parts.

Try any standard LOGAN device in your plant on thirty days approval. Just send us a sketch of the work you have to do, and our engineers will recommend a LOGAN Device guaranteed to increase your production, cut your costs and save your time.

Logansport Machine Co.

LOGANSPORT INDIANA

These Screws Saved $152,500 a Year on Budd Bodies

Is Your Company losing $10,000 a year *without knowing it?*

THE makers of Budd automobile bodies had been losing thousands of dollars a year* without knowing it. This loss was discovered after Hardened Self-tapping Sheet Metal Screws were adopted for making fastenings to sheet metal.

Like Budd, your company may be losing a lot of money every year on sheet metal assemblies. The amount may run to only $10,000; it may be $100,000! Find out.

Try Self-tapping Screws on your own work. The test may show you, as it has shown Budd and thousands of manufacturers, how to save from 25% to 75% in time and labor on sheet metal assemblies.

No other means of joining sheet metal and making fastenings to sheet metal is so easy, speedy and cheap. Just turn a Self-tapping Screw into a drilled or punched hole with a screw driver. It taps its own thread; makes a fastening that is equally as secure as a machine screw fastening—with the advantage that it will not loosen as readily under vibration. Don't fail to test these Screws. The coupon below may be worth $10,000 to you. Use it.

**A Survey by independent engineers shows how Budd saved $152,500 a year through the use of these Screws*

PARKER-KALON
HARDENED SELF-TAPPING
Sheet Metal Screws
PATENTED [illegible] — OTHERS PENDING

Parker-Kalon Corp., Dept. E., 192-196 Varick St., New York

Please send me samples of Hardened Self-tapping Screws.
I want to try them out for:

____

Name____________________

Address____________________

"Don'ts" for Chuck Users

Don't run a Chuck or face plate up to the shoulder suddenly; it strains the spindle and threads and makes removal difficult.

Don't run a Chuck or face plate from the lathe spindle carelessly; if you drop it on the ways of the lathe you are apt to damage the chuck and the machine also.

Don't use a poorly fitted wrench. If a wrench is not the right size, it will tend to round over the corners of the wrench and enlarge the holes in the jaw screw. Use the wrench that comes with the Chuck.

Don't screw a Chuck on a spindle nose without taking the lathe center out of the spindle.

Don't tamper with your Chuck, when you think it is out of true, until you know where the trouble is; it may be that your face plate needs truing up.

Don't attempt to force jaws in wrong slots. Be sure the number on the jaw corresponds with the number on the body below the slot. It belongs there.

Don't throw on the power until you have revolved the spindle by hand; a collision between a chuck jaw with the power of a six-inch belt behind it and your lathe carriage or tool post rest does not help the lathe. It does not make the Chuck work any better, either.

Don't leave the wrench in your Chuck when you start up the machine; it might not do any damage, but then again it might.

Don't use an ordinary screw driver to take out a machine screw.

Don't use your Chuck too often for work that is oversize.

Don't throw out the stud on a Combination Chuck just to see how it works; the Chuck is set true for universal work when it leaves the factory and it should be left that way until it is needed as an independent Chuck.

Don't brush chips towards the headstock; if you always brush them toward the tailstock, you will keep them out of the working parts of the Chuck and lathe.

(From "Chucks and Their Uses," published by The Skinner Chuck Co.)

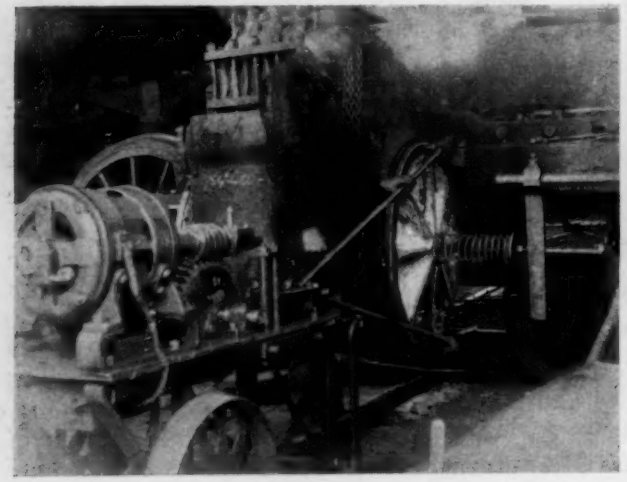
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay $5 for each one published.

Grinding-In Cylinder Heads In D. & S. L. Shops

By Jos. C. Coyle

IT IS well-known that when cylinder head joints on a locomotive are properly ground and fitted, the use of gaskets is eliminated. The weight of the head, however, and the difficulty of applying an even pressure while imparting motion to the head, make this operation extremely tedious unless the proper equipment is used. The task of grinding-in a head by hand is both laborious and expensive, and many of the improvised power hook-ups are unsatisfactory.



Cylinder Head Grinding Machine in Operation

At the Denver shops of the Denver & Salt Lake Railroad a machine has been devised for this work which is giving excellent satisfaction. By using this outfit a cylinder head can be ground-in in 30 minutes by one man. The power unit consists of a 3 h. p. electric motor which drives a worm and worm wheel, and thus transmits power to a cam, as shown in the illustration. The cam operates two cross-heads which are connected to the cylinder head by two knuckle-jointed sections of 1½-in. pipe that are attached to the head by right-angle swivels.

The cylinder head is held in place by a strong coiled spring which is approximately 20 inches long when released. This spring is held by an 8-in. metal disc, on a screw bolt inserted through the 2x4-in. steel arm of an "old man." A 2x6-in. section of steel bar, several inches in length and containing two bolt holes, is welded to the base of the "old man" to provide for anchoring the old man to the pilot beam of the engine.

The power unit is mounted on a portable truck of heavy iron. Two short sections of 2-in. angle iron are used as blocks for the wheels when

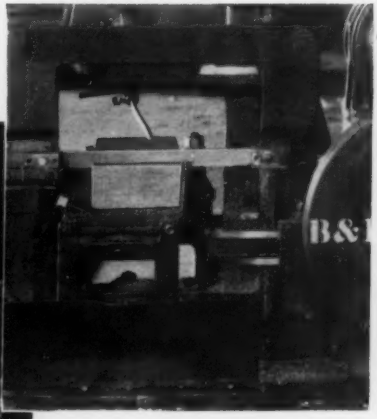
(Continued on page 61)

The Metal Cutter and Grinder

FEBRUARY, 1930

Black and Decker use Simonds High Speed Steel Hack Saws

World Known Electric Tool Makers Do Difficult Metal Cutting with Red Streak High Speed Blades.



When such important manufacturers as Black & Decker of Townsend, Md. are enthusiastic in their praise of the Red Streak High Speed Steel Hack Saw, there is the assurance that this blade is of the highest standard of quality.

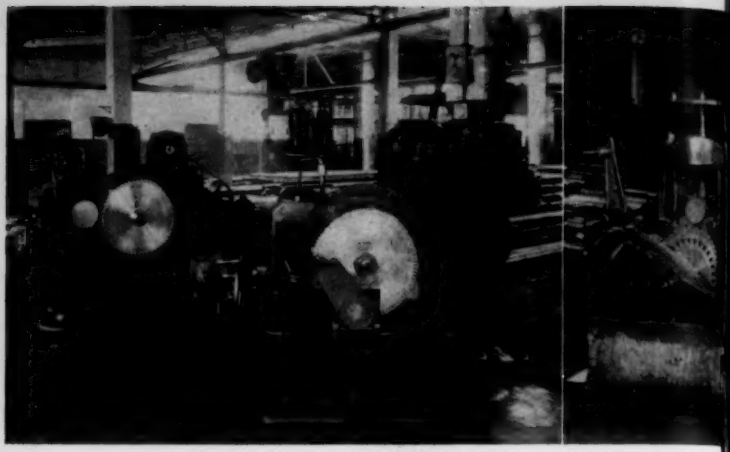
In their plant, as the illustration shows, Black & Decker use this efficient blade to cut tool steel and shapes of the high grade steels used by them. Red Streak, the blade with the identifying back edge of red, pleases many others wherever production metal cutting is essential.

A Band That Gives You Better Service

The Simonds metal cutting band saw blades of the spring temper type for high speed machines make quicker work of cutting tough metals. It does an extraordinary amount of cutting before it becomes dull.

It's economical, too, for this blade can be refiled and set when dull at a cost much less than that of a new blade.

The steel in this blade is especially prepared to stand the bending and unbending as it goes over the wheels. The gullets are rounded to prevent cracking and breaking of blades.



Equipped with Red Streak Simonds These Machines Cut Hard

Battery in Cambridge Plant Used for Cutting off Steel of Tough Temper and as High Carbon Analysis as 269 Burnell Gives Excellent Service.

The cutting and edge-holding quality of the new Simonds Inserted Tooth Saw is testified to by the service they are giving Wheelock, Lovejoy & Co., Inc., in Cambridge, Cleveland and Chicago.

The accompanying picture shows a battery of machines equipped with the Red Streak Simonds Inserted Tooth Saws. This picture is from the Cambridge, Mass. plant where steel for practically every purpose is cut to specifications and, of course, the very best saws are necessary. This is why Wheelock, Lovejoy & Co., for over 14 years, have standardized on Simonds metal saws. Every possible shape for tools or machine parts is cut at the warehouses of this company; spindles, shafts, axels, clutches gears, racks, pinions, discs, etc.

These saws cut Hy-ten steels of tempers ranging from 20 to 95 carbon. It is interesting to note that Simonds Saws are used here to cut 50 carbon analysis alloy steel as hard as 269 Burnell.

WRITE FOR YOUR COPY

Hacksaw-ology

Tips on Metal Cutting—IT'S FREE

SIMONDS SAW AND STEEL CO., Fitchburg, Mass.

Established 1832—8 Factories, 16 Branches

imonds Saws ardest Metal

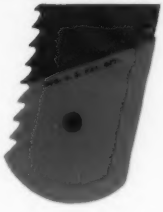
Flat Ground Stock is The Perfect Steel

A New Simonds Product Ground Accurate and Ready For Use

Die makers and other mechanics are saving time lost in grinding stock to correct thickness for jigs, gauges, templates, tools and other particular jobs by using Simonds Red Streak flat ground stock. This stock is made of Simonds high carbon tool steel, uniformly annealed, cut to the proper length and ground to width and thickness by the new Simonds method. New equipment grinds flat stock to one-half thousandth plus or minus. This stock is furnished in all standard thicknesses.

LIKE A *flash*

"RED STREAK" *comes to ease your cutting labor*



It pays to choose hack saws with the same care given to any other tool purchases. The brilliant RED END on Tungsten blades and the RED BACK EDGE ON high speed steel blades is your best guide. Those symbols designate Red Streak, the better hack saw blades. New, more efficient and edge-holding.

Identified by
RED END for Tungsten
RED BACK – High Speed Steel Blade

SIMONDS
METAL SAW MAKERS

FOR PORTABLE TOOL OPERATIONS.

Manufactured to meet all the requirements of present day grinding, you can count on a free, fast cutting wheel.

For high speed operation, the Abrasive wheel, bonded with Bakelite, with its porous open structures, removes maximum metal.

Where ordinary operating speeds are used the Abrasive wheel, vitrified bonded, will prove itself to your satisfaction.

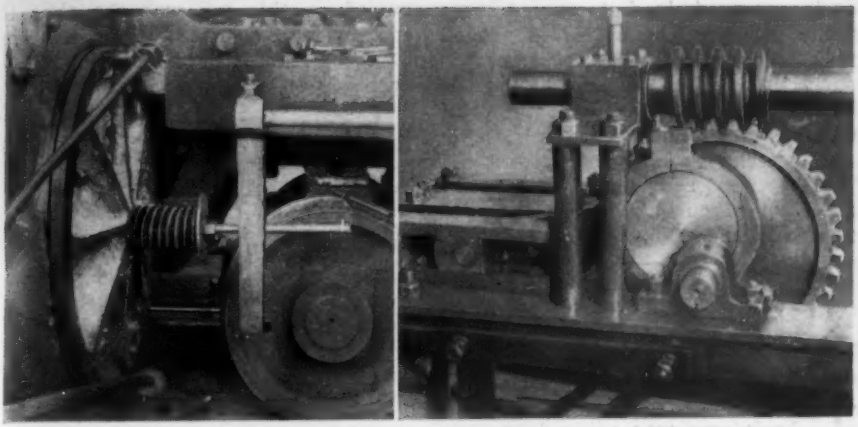
Check a Borolon or an Electrolon wheel, the former for grinding steel and other materials of high tensile strength, the latter for grinding cast iron and materials of low tensile strength, under your own shop conditions and notice their free, fast action.

ABRASIVE COMPANY.

DIVISION OF SIMONDS SAW and STEEL CO.

TACONY & FRALEY STREETS
PHILADELPHIA, PENNA.

ABRASIVE



(Left)—View Showing "Old Man" Holding Spring in Place. (Right)—Showing Worm, Wormwheel, and Cam.

Grinding-In Cylinder Heads

(*Continued from page 56*)

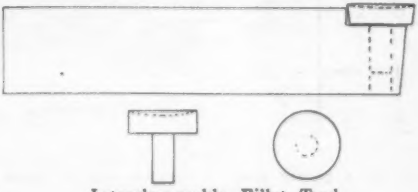
the machine is in use, the wheels being held firmly against these blocks by a rod with a forked hook at each end and a turnbuckle in the middle. The rod is hooked into the under frame of the truck and then over the track rail, the turnbuckle providing for the necessary tension. Several rods of different lengths are kept on hand for use in different locations as it is not always possible to set the machine at the same distance from the rails. Extensions are also provided for the rams, for the same reason. A mixture of emery and hard grease is applied to the end of the cylinder before the head is placed for grinding-in.

Interchangeable Fillet Tool

By H. L. WHEELER

A FILLET-CUTTING tool which has several unique and interesting features is shown in the drawing herewith. While the tool may not be efficient on small work, it is particularly adaptable for use in a shop handling large work and where a variety of fillets of various sizes are required to be cut.

The cutters only are of high speed steel, the shank of the tool being of ordinary machine steel. As the cutting edge of each tool forms a complete circle, the tool can be revolved to present a new cutting edge each



Interchangeable Fillet Tool

times the portion in use becomes dull, until the entire edge has been used. The tool shown here can be used many times as long as the usual type of tool before regrinding is necessary.

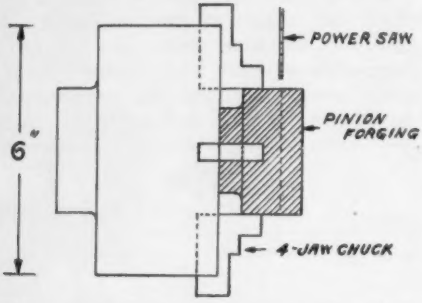
The shank is of the usual tool-shank size—⅝ x 1¼-in. or ¾ x 1½-in.—and is made with a step at the front end in which a hole is drilled and reamed for the cutter-shank. This shank should be ½-in. or ⅝-in. in diameter, and should be a drive fit or light press fit in the shank, so that it can be

easily pressed in but cannot turn while in use. The cutter is ground with the usual clearance and the top surface is ground concave to provide the necessary rake. One of the principal advantages of this tool lies in the interchangeability of cutters. If properly designed and made, a complete set of cutters can be made to fit one shank.

The Power Saw As a Production Tool

By C. R. DILTHEY

THE sketch shows how a power hack saw was utilized to save time on a facing job. We had a number of obsolete pinion forgings on hand, and it was decided that, by cutting approximately 1 in. off the front ends, these forgings could be made into



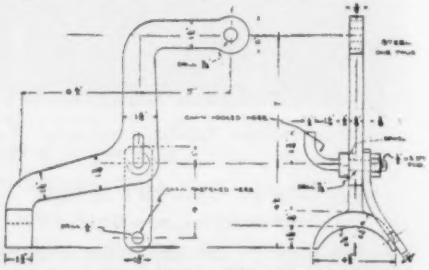
Using a power saw to remove surplus stock from pinion forgings.

pinions of a smaller size. In order to save time on the facing operation, we clamped a 6-in. 4-jaw chuck in the vise of a power cut-off saw, and used the saw to cut off the bulk of the surplus stock. Thus a lathe was released for other and more important work, and the only time required on this job was the time it took a man to change pieces. The idea contained here should be useful on many other similar jobs.

Device for Handling Car Wheel Axles

By J. H. HAHN

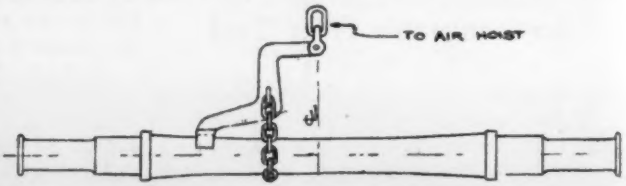
THE accompanying drawings show the design of a "device for lifting car wheel axles" which has been



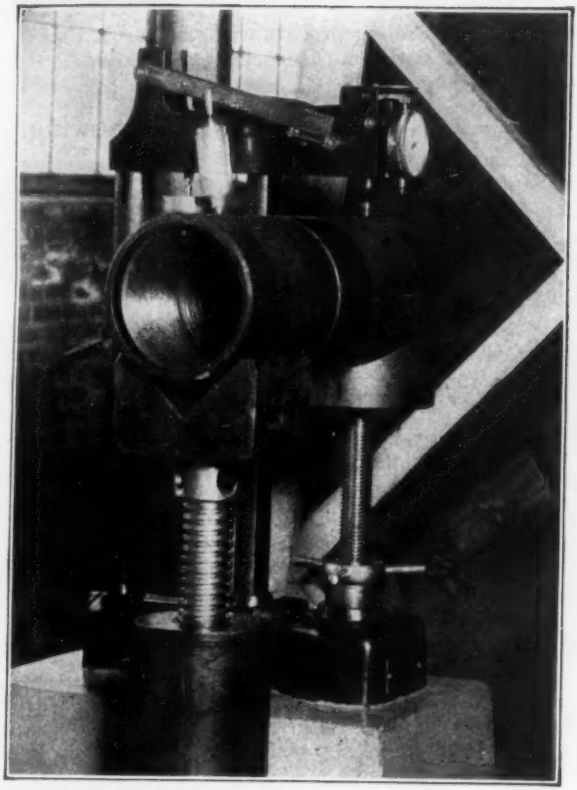
Design of device for handling car wheel axles.

in use in our shop for some time and which may be interesting to other railway shop men. Shops in which the machining of these axles is handled in machines of the center drive type will find this device particularly adaptable. Not only is it an efficient piece of equipment, but it also has merit as a safety device, as the construction of the device prevents the axle from slipping or becoming unbalanced.

The main section is made from ¾-in. steel, forged to the shape shown. The upper end is drilled ⅞-in. for attaching to the air hoist, and the lower



Showing how axle-handling device is used.



The

ROCKWELL

Hardness Tester

A word or two about the range of sizes of parts it will handle.

WHILE the Bausch and Lomb Optical Company use the "Rockwell" for testing microscope rack and pinion cutters, dies, and taps of a diameter as small as 0.050", others are using it on oil well tools and other big work including circular saws of 72" diameter.

It tests hardness with equal precision on all sizes of work.

WILSON-MAEULEN CO
INCORPORATED

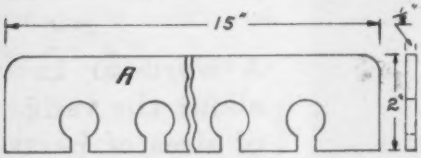
Concord Avenue and 143rd. Street **New York**

end is forked to take the axle. A lug which is bolted to the main section at the central point serves both to steady the piece and as a means of attaching one end of the chain. The other end of the chain is hooked over the curved stud after it has been passed around the axle. This means of handling axles will be found to be simple, positive and safe.

Hardening Thin Gauges

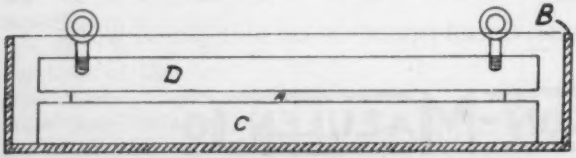
By CHARLES KUGLER

WE had three gauges to make in accordance with the design shown as **A** of the accompanying illustrations. Everything went well until the gauges were ready to harden. The first was hardened in the usual



Design of gauge.

manner, but it came out of the oil bath so badly distorted that it was entirely useless. We then obtained a shallow pan, shown as **B**, in which we placed a flat plate, **C**, and then filled the pan partly full of oil. Another flat plate, **D**, was fitted with a couple of eye-bolts for ease in handling and placed within reach. The second gauge was then heated in the usual manner and when it was ready for quenching it was placed on plate **C** and plate **D** was immediately placed on top of it. The weight of plate **D** kept the gauge straight during the cooling process with the result that it came out surprisingly straight.



Cross section of oil bath, showing lower and upper plates with gauge **A** between.

"Kinks" Worth Knowing

By R. H. KASPER

THE average cutting compound is an alkali and will neutralize acids, therefore it makes a good wash for soldered work.

Boric acid, if applied to warmed tool steel, will prevent the formation of scale when hardening.

To copperize brass or bronze for scribing lines, apply the copper solution and rub with iron fittings.

A few camphor balls, placed in the tool box, will keep the tools from rusting.

Mercury will dissolve lead or solder without the application of heat.

A scriber or engraving tool can best be hardened by heating to redness and pressing into a piece of yellow laundry soap.

Milk is the best lubricant to use when drilling small holes in copper.

A piece of work will not case harden in any part which is first copper plated.

Rubbing an ordinary white pebble on the face of a grinding wheel will glaze it slightly so that a smoother finish will be produced on the work.

Linseed oil is the best lubricant to use on press fits, as it hardens afterward and increases the grip.

A softer wheel is usually chosen for hard than for soft steel, for equivalent operations. One reason is that the harder steel has more tendency to dull the abrasive points; hence we want the wheel to wear a little faster to present new sharp grains.

—(Norton Company)

Barnes Upright Drills

Barnes 22½-inch Stationary Head Drill with Silent Chain Motor Drive

With Stationary Head—
15, 20, 22½, 25-inch swing.

—

With Sliding Head—
22, 26, 28, 34, 42, 50-inch swing.

—

Gang Drills—
20 to 26-inch swing.

Barnes Upright Drills are made in a range of sizes from the 50-inch swing, required in the railroad shop, to the 15 and 20-inch sizes used in the small machine repair shop and garage service.

Arranged for Silent Chain or Belted Motor Drive. With or without Power Feed.

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W. F. and JOHN BARNES CO.

ROCKFORD, ILLINOIS

Upright Drills Screw Presses
Horizontal and Vertical Production Drilling and Boring Machines

Across the Desk with

HOWARD CAMPBELL, *Editor*

OUR greatest national "bug-a-boos" have been war and panics. The greatest individual calamity for the average man is unemployment. Panics have been practically rendered impossible by the establishment of Federal Reserve Banks; an effort is now being made by the guiding forces of our greatest nations to abolish war, and our national government is making an investigation into ways and means for keeping the industrial wheels of this country turning at an even pace.

It has been estimated that the elimination of seasonal unemployment would save American business something like two billions of dollars per year. Ways and means for accomplishing the desired end may depend largely upon the products, but unquestionably some progress could be made in any plant that is engaged in manufacturing. A number of large firms have already taken steps in this direction, and most of these firms report that the most important—and most surprising—result has been a considerable increase in business. Other benefits consist in more efficient labor, important economies in production, and a noticeable increase in organization morale. Industrial executives who have been side-stepping this problem as being no concern of theirs might find it worth looking into from—at least—a standpoint of cold dollars and cents.

SOMEONE has said that "property is an extension of personality." No truer statement was ever made. The clothes a man wears, the kind of house in which he lives, his automobile, his business office or workshop, his tools—in fact, everything over which he has control, indicate the quality and condition of his mind. And nowhere is that statement more applicable than in the shop.

The general atmosphere of a plant indicates, to a large extent, the personality of the man at the head of it. Individual departments may—and do—reflect the personalities of the foremen directly in charge, but if the condition of the department does not also reflect the personality of the management, that foreman is in danger of being removed and replaced by one whose methods are more to the liking of the manager, and this, again, is an extension of the personality of the manager.

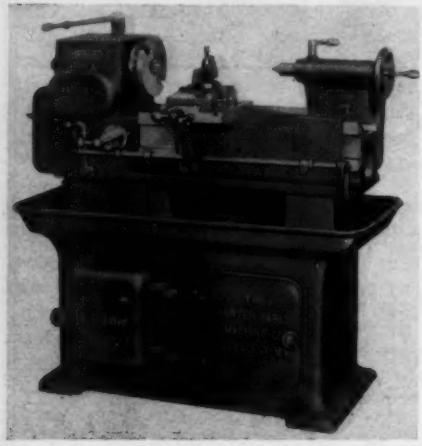
It is not hard for the keen observer to quickly gauge the size and condition of the mind of a foreman or other department head. Dirt invariably indicates slovenly mental processes, which is just another way of saying that it indicates an untidy, chaotic mind. Stock or tools in disarray indicates lack of system, and consequent lack of efficiency. Waste of effort and material is a natural result.

A good workman can easily be discovered by the condition of his tools. The qualities of a good foreman are reflected in the condition of his department. The ability of a good manager is evidenced by the condition of his plant, and in many cases not only the quality of his product, but also the progress of the company—or lack of it—is apparent to those who are able to read the signs.

New Shop Equipment

Porter-Cable Carbo-Lathe

The Porter-Cable Machine Co., 300 Wolf Street, Syracuse, N. Y., has brought out a lathe which is especially designed for use with tungsten carbide tools, high speed steel, or any of the advanced cutting alloys. The Carbo-Lathe, as it is known, swings 12 in. diameter by 18 in. long, and is intended particularly for handling short pieces of approximately 7 in. maximum diameter. Unusual rigidity is obtained through making the headstock and bed in one casting of chrome nickel iron. The tail-



Porter-Cable Carbo-Lathe

stock is of sturdy one-piece construction, weighing 100 pounds, and is rigidly clamped to the bed by two draw bolts on a heavy gib. The ways are relieved in the center, making two-point contact possible. The centers are of high speed steel, with No. 3 Morse Taper. The base is in one piece, of cabinet design, and contains the chip pan, oil reservoir, and short legs on which the bed is mounted.

Smooth control and a steady pull are provided by the disc clutch. Instant starting is obtained at high speed even under heavy cut. Except for occasional greasing, the ball bearing clutch pulley requires no attention and equals the life of the machine. The control lever serves two purposes—to operate the clutch and to control the brake spindle. The spindle is driven through spiral and worm gears and the feed is also driven by worm and spur gears. The spindle change feed gears provide a ratio of from 9.1 maximum to 1.75 to 1 minimum between clutch shaft and spindle and further ratio is possible by changing the size of the pulley on the motor, or by employing variable speed motor. Carriage feed pick-off gears provide feeds of .005, .010, .015, .020, .025, and .030 in.

Power is applied through a motor of either 3 or 5 h. p., located in the base and mounted on a hinge plate so that the weight of the motor will keep the belt taut and thus eliminate idler pulleys. A 3-in. flat belt is used. Timken roller bearings and anti-friction bearings are used throughout.

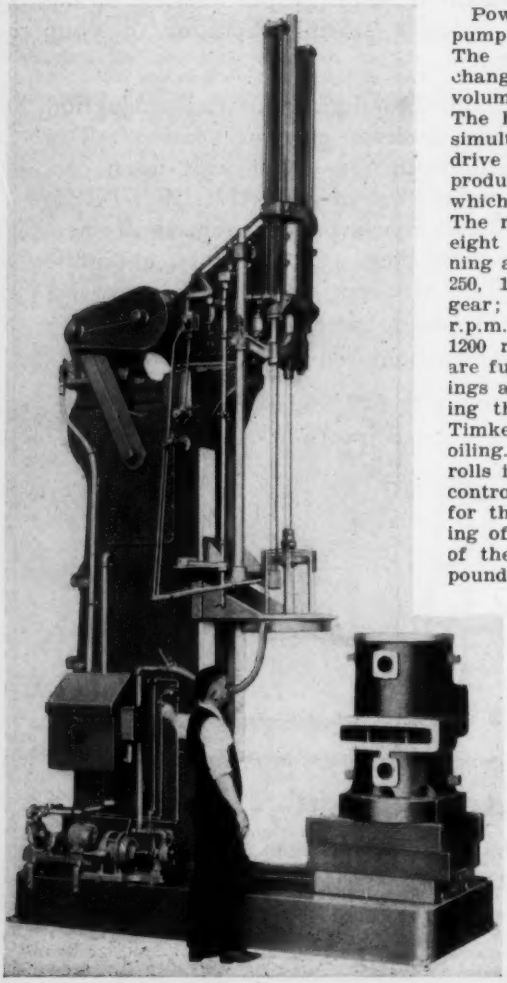
The spindle height from the floor is 42 in., and the machine can be installed in a space 34 x 48 in. Standard equipment includes a wheel-operated tailstock which can, however, be changed for a lever action by substituting certain parts. An air cylinder can also be applied for operating chucks, collets, and expansion arbors. The facing attachment is moveable along the bed, securely clamped in any position, and is driven from a rack in the bed ways. Fast and slow speeds with quick return are provided by the cam-operated cross slide.

Barnes No. 3620 H. D. Vertical Honing Machine With Hydraulically-Reciprocated Spindle

In order that the advantages of honing may be obtained on cylinders for Diesel engines and other similar large units, the Barnes Drill Company, 801-851 Chestnut Street, Rockford, Ill., has developed the No. 3620 Heavy Duty Verti-

cal Honing Machine with Hydraulically-Reciprocated Spindle shown in the illustration. This machine will hone cylinders up to 20 in. diameter by 60 in. long, the maximum length of stroke being 56 inches. Longer or shorter maximum stroke can be supplied as required.

The machine stands on a base that is 58 x 117 in., and reaches to a maximum height of 18 ft. 8 in. The distance from center of spindle to face of column is 18 inches. The spindle, in which ten splines are cut, is 3 in. in diameter. The hone, which may be from 4 in. to 12 in. long, is especially designed for this machine and the spindle and hone assembly are balanced by a patent air counterbalance. The duplex hydraulic cylinders for reciprocating motion, and the duplex torque bars and bracket which eliminate any possible vibration at any speed of reciprocation, are outstanding features of this machine.

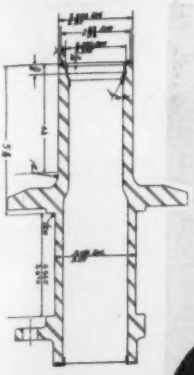


Barnes H. D. Vertical Honing Machine

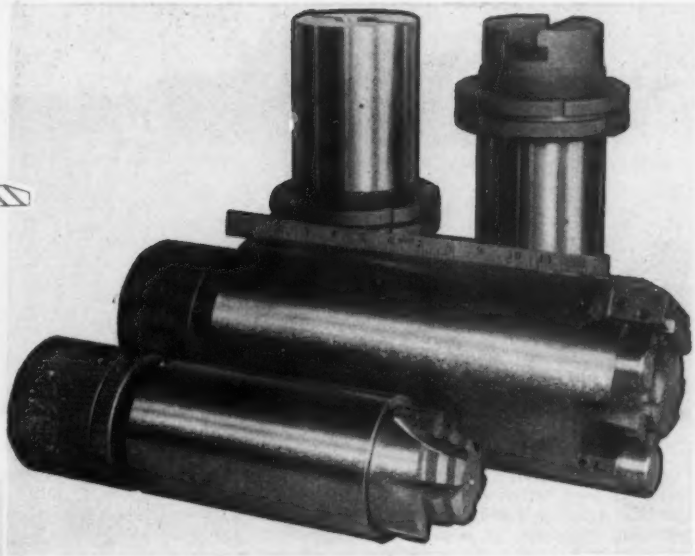
Power is applied through an Oilgear pump with special 3 in 1 valve control. The cycles of reciprocation may be changed to suit the job by means of a volume regulator control on the pump. The hydraulic motion for reciprocating simultaneously with the powerful geared drive for rotating the spindle and hone produces an even and uniform stroke which is necessary for successful honing. The machine as shown is equipped for eight speeds with the drive shaft running at 400 r.p.m. These speeds are 354, 250, 180, and 128 r.p.m. without back gear; with back gear, 89, 63, 45, and 32 r.p.m. The machine is driven by a 20 h.p. 1200 r.p.m. motor. All rotating parts are fully equipped with radial ball bearings and Timken roller bearings, including the spindle, which also rotates in Timken bearings. All bearings are self-oiling. A work-table is provided which rolls in and out on ball bearings and is controlled by an air cylinder, to provide for the convenient loading and unloading of heavy cylinders. The net weight of the machine is approximately 12,000 pounds.

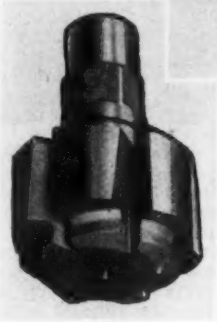
G. E. Automatic Welding Electrode Feeding Device

The General Electric Company, Schenectady, N. Y., announces an improved feeding device on its automatic welding head to meet advances in the art of automatic welding which call for an increased use of high welding speeds requiring heavier welding currents and larger sizes of electrode wire than have heretofore been used. This improvement consists of the addition of geared drive to what was formerly the idler roller in the feeding mechanism. In this way the



The heavy lines show cuts taken by these tools.





MORSE Simplicity is maintained throughout the design of this set-up. The cutter is driven by a hexagon milled on the end of the shank. It has a double bearing — one on each side of the hexagon drive—assuring perfect alignment.

ANOTHER SPECIAL MORSE *SET-UP!*

THE illustrations show a very efficient and unique set-up of MORSE special form cutters used in the largest axle plant in the world. These cutters are used for machining the inside dimensions of the brake spider for a new truck axle. Time savings and better work are the results obtained with these tools.

You can increase the productiveness of your equipment by using MORSE Tools especially designed for your work. Just send us a blue-print of your part and we will design a tool that is guaranteed to increase your production and give you a better job.

MORSE COUNTERBORE & TOOL CO.

12281 TURNER AVE. DETROIT, MICH.

Cincinnati 28 x 40 x 48-in. Plain Cylindrical Grinder

large sizes of wire, which are stiff and hard to feed without excessive pressure on the driving rolls, are positively fed without slippage, at a regular rate and with only a moderate pressure between the driving rolls.

This device also extends the uses for automatic welding by making it now possible to use curved nozzles so as to reach into otherwise inaccessible places, and to weld in abnormal positions. Such cases were formerly considered impractical, if not impossible, on account of the difficulty of conforming the heavier wires to any other shape than their natural curvature as they come from the reel.

For the majority of applications the present practice in automatic welding requires electrode sizes from ⅛-in. to ¼-in. diameter. The improved drive roll gears furnished on heads for these normal applications will accommodate any size wire from ⅛-in. to ¼-in. diameter without changing gears. Below ⅛-in. the gears are not needed and it is only necessary to remove one gear—that on the drive roll shaft. Sufficient pressure can then be obtained for these small sizes of wire, by screwing down the adjustment on the binding roll.

Cincinnati 28x40x48-in. Plain Self-Contained Cylindrical Grinder

The machine shown in the accompanying illustration is a 28 x 40 x 48-in. plain self-contained cylindrical grinder that has been built by Cincinnati Grinders, Inc., Cincinnati, Ohio, for a manufacturer of gear-cutting machinery. The machine is designed to afford a maximum of accuracy under heavy cuts on large work, the design including a well proportioned and heavy bed, with ample lubrication to all moving parts.

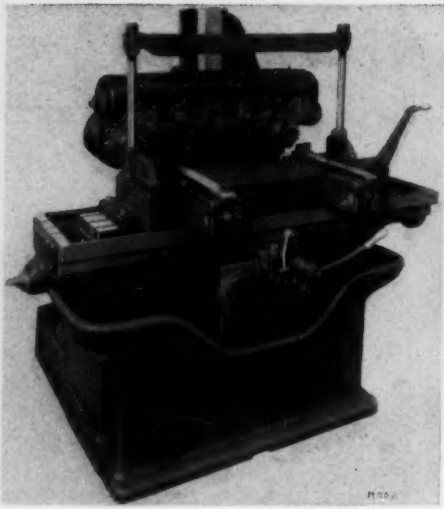
The machine is equipped with rapid traverse to the wheel slide unit, which expedites the grinding of work with several diameters varying considerably in size. The workhead is equipped with a variable speed motor, which, with the aid of a rheostat mounted on the front of the machine within ready reach of the operator, provides an infinite number of speeds to the workhead within a 3-to-1 range.

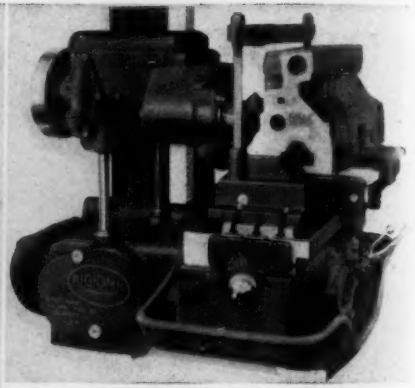
An individual motor drive coolant pump is located at the rear of the machine in such manner that the rotor of the pump is below the level of the coolant supply tank. This feature makes priming unnecessary and provides for accessibility in case of repair. The coolant valve is located directly over the pump and is provided with a control rod which makes it unnecessary for the operator to reach over the work to adjust the valve.

The machine is particularly adapted for grinding large diameters of comparatively short length, such as flanged spindles, gear blanks, locomotive pistons and piston rods, and so on.

Sundstrand No. 3-W Rigidmil

The Sundstrand Machine Tool Co., Rockford, Ill., is now building a Rigidmil to be known as the No. 3-W, and





Sundstrand No. 3-W Rigidmil

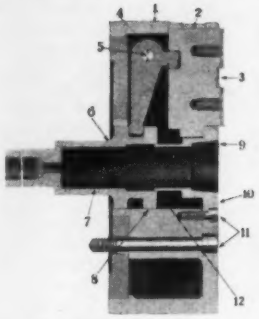
which is of the same general design as the No. 3 with the exception that certain features are incorporated which are intended to increase the application of special single and multiple spindle heads. The No. 3-W is also heavier, has a higher column to provide greater flexibility for special heads, and has a compartment for chips with a drop door to clean out in the base of the machine. Both the saddle and table are of larger proportions, also, and an increased minimum power feed travel is provided. The feed control and table stops are thoroughly protected from chips and coolant.

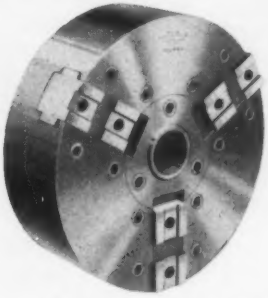
The machine can be provided with either of two throat distances; 12⅝ in. or 17½ in., the former being designated as the No. 3-W-1 and the latter as the No. 3-W-2. This construction makes possible the mounting of special heads on the spindle column for milling on large or cumbersome pieces of work without sacrifice of table working surface. Power feed and rapid traverse to the table in both longitudinal directions are controlled through a single lever located on the front of the machine. The rapid traverse is 102 in. per minute—same as the No. 3. Automatic table control which will return the table to the starting or loading position automatically at the completion of the cut can be provided.

The spindle is forged from carefully selected steel, accurately machined and carried in Timken roller bearings. It has the National Standard Nose with hole 2¾ in. diameter at large end and 3½ in. taper per ft. The entire spindle assembly is carried in a hardened and ground steel quill of 6 in. diameter with 3½ in. traverse adjustment. The driving pinion and shaft are in one piece, mounted in Timken roller bearings. A range of spindle speeds from 17 to 241 r.p.m. is provided by pick-off gears, located in the main casting just below the column. Vibration and chatter are eliminated by a flywheel on the rear end of the spindle. Pick-off gears also provide for feed changes from 1.9 in. per min. to 21.4 in. per min. The feed box is a compact unit in which power feed and rapid traverse in either direction is controlled by a single lever. Like the speed unit, it is easily accessible. All gears are made of alloy steel heat treated, and all parts run in a bath of oil.

The working surface of the table is 16½ x 60 in., although a longer table can be supplied. The saddle is exceptionally wide and long, the saddle for the standard 34 in. table being 42 in. long. The main drive clutch, which is a compact, powerful, sensitive unit of the multiple disc type, runs in a bath of oil and is easily adjusted. Coolant is drawn from a large reservoir in the main casting and is pumped to the cutters at the rate of 3½ gallons per minute. Belt or motor drive may be used. Arrangements for motor drive include an adjustable plate for the motor, secured to the column at the rear.

Hannifin Air Operated Chucks





DETAILS OF
HANNIFIN
Model "B" Air Chuck

1 **BODY**—One-piece electric steel casting.
2 **SINGLE HEAVY DUTY SLOT.**
3 **MASTER JAWS**—Carbonized, hardened and ground.
4 **JAW OPERATING LEVERS**—One-piece extra heavy chrome nickel forging, heat treated hardened and ground.
5 **PIN**—Chrome nickel, heat treated, hardened and ground.
6 **DRAW SLEEVE** — One-piece chrome nickel, heat treated, hardened and ground.
7 **DRAW SLEEVE**—Bored to accommodate boring bar pilots.
8 **DRAW SLEEVE**—Ground slide fit in chuck body.
9 **PILOT BUSHING** — Mounted in taper bore of pilot plate assures rigidity and accuracy.
10 **HARDENED AND GROUND PILOT PLATE**—Mounted on the face of chuck reinforces chuck body.
11 **HOLLOW HEAD SCREWS**—Heat treated nickel steel.
12 **ACCURATELY GROUND FIT** of pilot plate and draw sleeve makes chuck dust-proof.

Stay "On the Job!"

That is why so many concerns are standardizing on these chucks. Hannifin Air Operated Chucks are constructed to a design that guarantees precise machining, absolute accuracy, and interchangeability.

They have a minimum number of working parts and the one-piece electric steel body gives unusual strength with lightest practical weight. A single set of grooves replaces the old style multiple grooves—another important improvement which assures long life and proper load distribution—resulting in the chuck retaining its accurate fit indefinitely.

There is a Hannifin Air Operated Chuck for every requirement. You'll find the particular chuck you need listed in our catalog. Be sure you get a copy—write for it TODAY!

HANNIFIN MFG. CO. 621-631 S. Kolmar Ave. CHICAGO, ILLINOIS

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Frederick Strasse, Berlin, Germany.

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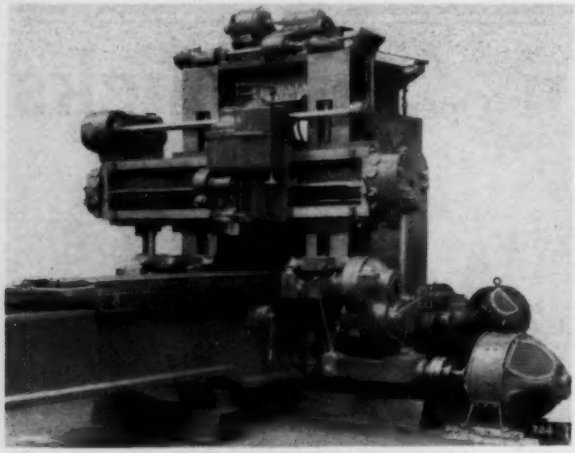


Cincinnati Planer-Type Miller

Cincinnati Planer-Type Miller

A newly designed heavy duty 30" x 30" Planer Type Miller has been placed on the market by The Cincinnati Planer Company, Cincinnati, Ohio. This size fills in a complete line of Millers. Several unique improvements have been made. The table and feed control lever operates the table for either rapid traverse or feed, and is designed to prevent both engaging at the same time. For feeding, this lever engages feed to head as well as the table. Direction of feed is controlled by direction of motor or with reverse feed mechanism on each side head and on end of rail for rail head.

The drive to the spindles has been placed on the right hand side for side heads and on the left hand side for rail heads.

All drive shafts are driven with spiral bevel gears running in oil, and anchored in Timken Roller Bearings.

Cincinnati Special Planer With Grinder Head

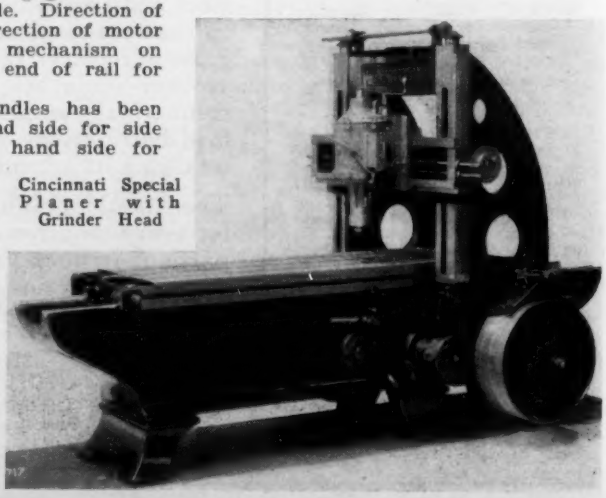
The Cincinnati Planer Company has added the special Planer Type Grinder to its line. This attachment can be applied to any size Planer.

The photo shows a 30" Medium Pattern Planer arranged for grinding with a cup wheel, driven with a three horsepower motor. The up and down movement for setting the wheel can be made from end of rail or by means of crank handle on the head. Power feed is also supplied to enable one to move head across the work.

This attachment is also made to grind on the periphery of the wheel. Both types have a large use in the Die Shop and Toolroom. The standard planer head can be left on machine if general planing is also to be done on same machine.

With the Patent Tu-Speed Countershaft, it is possible to obtain two speeds to the table. These speeds can be made to suit any job.

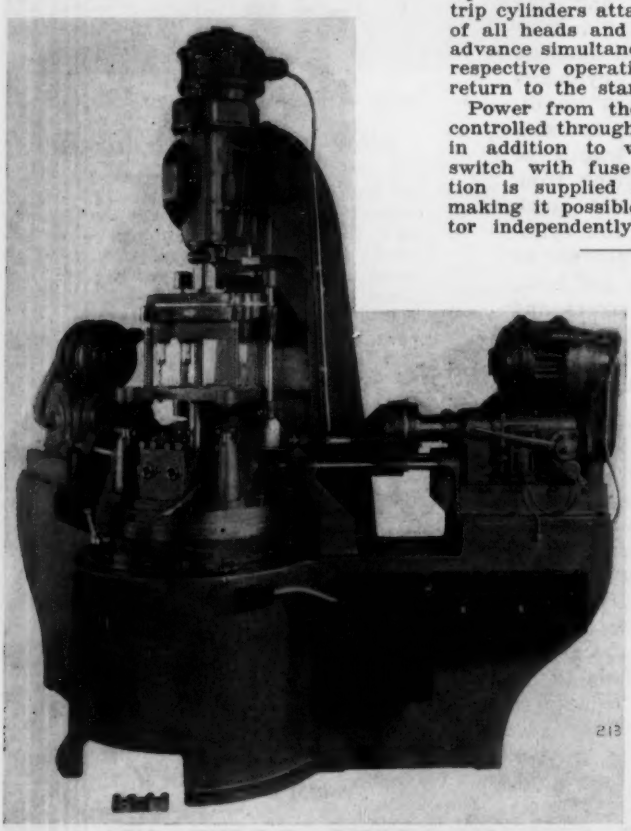
This machine is built with the same rigid construction and extreme accuracy which is characteristic of the equipment manufactured by this company. The table-ways are lubricated by a special method which insures plenty of oil at all times.



Cincinnati Special Planer with Grinder Head

Bradford Three-Head Machine For Drilling and Reaming Tappet Guide Holes

The illustration shows a three-head machine which has been built by The Bradford Machine Tool Co., 659 Evans Street, Cincinnati, Ohio, to drill and ream valve tappet guide holes in automotive cylinder blocks. This particular machine drills and rough reams four holes .613 in. in diameter by 1⅛-in. long, drills two 29/64-in. holes, and drills two 19/64-in. holes, operating at a cutting speed of 85 ft. per min. with a feed of .009 in. per revolution.



Bradford Three-Head Machine for Drilling and Reaming Tappet Guide Holes in Cylinder Blocks

At the first station, which is at the front of the machine, the operator loads and unloads the fixture while at the second station the machine is drilling four 39/64-in. holes 1⅛-in. deep on a horizontal plane and at the same time is drilling two 29/64-in. holes vertically. At the same time, at the third station four .613-in. holes are being reamed horizontally and two 19/64-in. holes are being drilled vertically. The entire operation is completed in 53 seconds, and one piece is finished at each cycle of the machine.

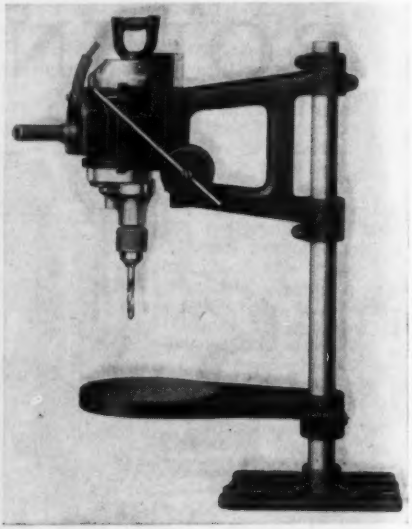
The indexing mechanism is operated by hand. The feed mechanism is controlled by a small hand valve which is mounted at the front of the machine. Operation of this valve connects air trip cylinders attached to the trip levers of all heads and causes all spindles to advance simultaneously to perform their respective operations, after which they return to the starting point and stop.

Power from the main line circuit is controlled through a push button switch, in addition to which an independent switch with fuse and overload protection is supplied for each motor, thus making it possible to operate each motor independently if desired.

Hisey Radial Drilling Stand With Sensitive Feed

The Hisey-Wolf Machine Co., Cincinnati, Ohio, has brought out a radial drilling stand with sensitive feed which can be furnished for use with all Hisey portable electric drills up to and including ⅞-in. capacity. The lever feed is operated through a rack and pinion in the same manner as a drill press, thereby providing for a positive and sensitive control without fatigue to the operator. The motor holding brackets are designed so that the drill can be attached

without removing any part of the machine, which is both a time-saver and a protection against loss of parts.



Hisey Radial Drilling Stand with Sensitive Feed

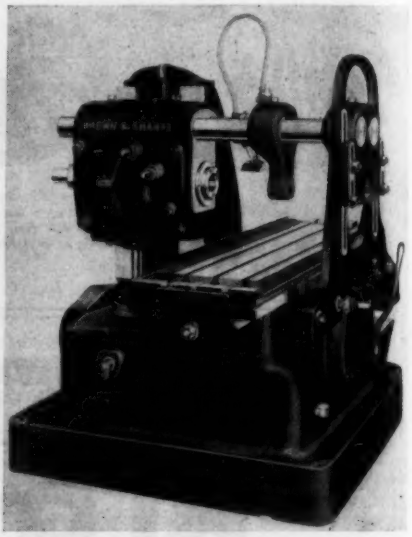
A vertical adjustment of 13 inches is possible on the main column, which is amplified by a vertical adjustment, without resetting, of 7½ inches by means of the lever through the rack and pinion. The maximum arm reach from column to drill spindle is 13 inches, and the arm will swing in a complete circle. The main column is 2 inches in diameter. Net weight, 150 pounds.

B. & S. No. 13B Plain Milling Machine

Brown & Sharpe Mfg. Co., Providence, R. I., announces the complete redesign of the No. 13B Plain Milling Machine. The feed ranges and capacity dimensions are nearly the same as those of the previous machine, having a longitudinal feed of 34 in., transverse adjustment of spindle of 4 in., vertical adjustment of spindle, 12 in. There are, however, certain new features and improvements that offer attractive production possibilities.

The top of the table is 32 in. above the floor, which is the usual conveyor height. The position of the driving

pulley at right angles to the table permits batteries of these machines to be driven by one line shaft, using a minimum of floor space. The bed, table ways and column are cast in one piece with frequent internal bracing webs. The table ways are 42 in. long and support the table for almost its entire length. Cross adjustment for the spindle of about 4 in. is obtained through the 7¼ in. diameter sliding sleeve, which carries the spindle and its bearings. The spindle head is massive and can be adjusted without fear of cramping or sagging, owing to a unique method of gibbing. It is clamped rigidly in position by four bolts. Adjustment is obtained by means of a long movable nut mounted on the stationary screw.



B. & S. No. 13B Plain Milling Machine

The table is wide and thick, and its entire top is finished as a working surface. Feed is controlled by a revolving nut mounted on a large diameter stationary screw. The overarms are of the double type. The outer brace can be left attached to the bed of the machine at all times, if desired. The arbor yokes, cutters and arbor can be removed without disturbing the outer brace. A rugged tie between the bed and the overarms is afforded by this brace, rigidly trussing all supporting members and reducing vibration to a minimum.

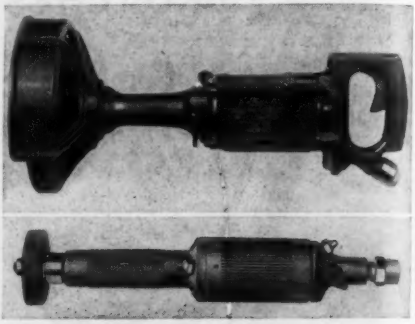
Power enters the machine through a

self-adjusting multiple dry-disk clutch. Drive is effected entirely through splined shafts and gears. Anti-friction bearings are used extensively throughout the machine. Bearings are spaced closely and, together with short, rugged shafts, insure the highest possible efficiency. The new No. 13B Plain Milling Machine can be operated with entirely automatic table functions when desired and adjustable dogs make possible a variety of operating cycles. One control lever operates all power movements of the table. This lever is directional and the change from cutting feed to power fast travel is obtained by a movement of the lever in a direction at right-angles to the table axis.

Thor Rotary Pneumatic Grinders

The Independent Pneumatic Tool Co., 236 S. Jefferson Street, Chicago, Ill., has developed a line of pneumatic grinders in which the design is based upon the rotary principle. These grinders were developed to conserve power and give wider speed limitations, as it is said that there are no inertia forces to overcome in starting and stopping. The outstanding features are light weight, governed speed, increased power, and lack of vibration. It is also said that the air consumption and unkeep costs are low.

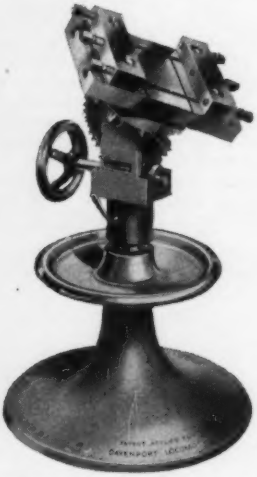
Thor Pneumatic Rotary Grinders are made in a complete line of sizes and types for all equipments. The line ranges from grinders having a speed of



(Above)—Thor No. 260-G Rotary Pneumatic Grinder. (Below)—Thor No. 00 Rotary Pneumatic Grinder—the Smallest Grinder of the Line. Runs at 28,000 r. p. m.

28,000 r.p.m. and carrying a 1¼-in. elastic bonded wheel to grinders having a speed of 4300 r.p.m., carrying an 8-in. elastic bonded wheel. The largest grinder

DIE SINKING *is a* MODERNIZED OPERATION



"WHY didn't someone think of it before?"—or words to that effect, is typical of the welcome accorded the DAVENPORT UNIVERSAL DIE HOLDING STAND among plant executives and die shop men. The advantages of this new equipment over the old style work bench are instantly recognized—and translated into terms of **time, labor** and **space savings.**

In every die shop—regardless of size—there's a place for DAVENPORT UNIVERSAL DIE HOLDING STANDS. The investment is small and the returns are handsome. Write for descriptive folder.

Davenport Locomotive & Mfg. Corp.
Davenport, Iowa

Sold Exclusively through

THE WESSON SALES CO.
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Representatives in All Larger Cities

DAVENPORT
Universal
Die Holding Stand

SAVE YOUR TOOLS - - - -

PROPERLY grind your tools on the GRAND RAPIDS TOOL and CUTTER GRINDER and they will cut faster, stay sharp longer and produce better work. All types of cutters can be accurately ground on this machine.

It is built with dual control for operation from either the front or rear, and has a self-contained motor drive which eliminates overhead shafting and belts.

Save your tools! There's a GRAND RAPIDS GRINDER for your job—send the coupon for full details!

GALLMEYER & LIVINGSTON CO.
348 Straight Ave. GRAND RAPIDS MICH.

GALLMEYER & LIVINGSTON CO. M 230
Grand Rapids, Michigan

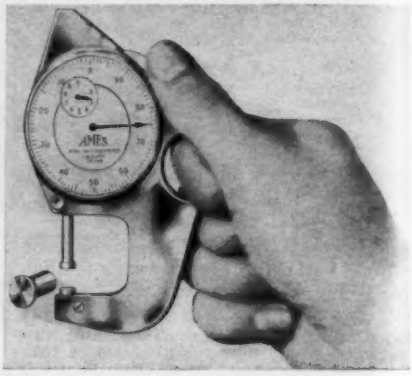
I want to save my tools. Send me full details.

Name .....
Firm .....
Address .....
City ..... State .....

is the No. 260-G, which weighs 13½ pounds. The smallest, No. 00, weighs 2¾ pounds.

Ames Dial Micrometer

A micrometer in which the Ames micrometer dial gauge principle is embodied and which is known as the Ames Dial Micrometer has been placed on the market by The B. C. Ames Co., Waltham, Mass. The moveable anvil is opened by means of a knurled thumb wheel and closes on the work by the action of a spring. The reading can be instantly and accurately taken from the face of the dial. The large dial is divided by 100 graduations, each representing 1/1000 inch. A pointer on the small



Ames Dial Micrometer

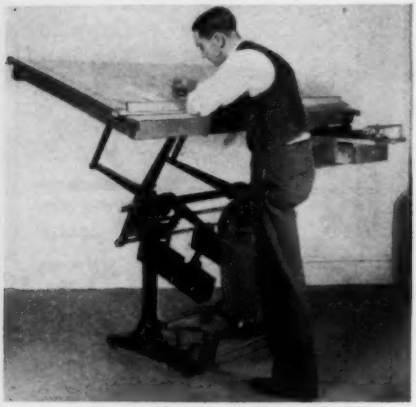
dial indicates the revolutions of the large pointer, each graduation representing 1/10 inch.

The operating mechanism of the micrometer is enclosed in a thin but rugged and durable chromium-plated case. A finger ring grip provides for ease in handling and full 1-in. depth of throat provides ample room for work. A snap lock on the spindle makes it possible to lock the spindle so that it can be used as a snap gage. The tool is light and compact and can be carried in the vest pocket.

"Auto-Shift" Draftman's Board

A draftsman's table which can be adjusted to any height or angle by the operation of a foot-lever is now being marketed by the Equipment & Supply Co., Inc., 51 Madison Ave., New York.

N. Y. The table is known as the "Auto-Shift" and is shown in operation in the accompanying illustration. The table-top, or board, is made of high grade

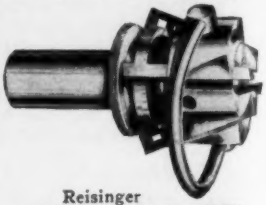


The "Auto-Shift" in use

materials, and the straight edge is counterbalanced so that it will hold its position at any angle of the board. The drawer and tray move with the board and remain in a horizontal position regardless of the position of the board. The board is perfectly counterbalanced and will hold any position in which it is placed. Adjustments can be made easily while the draftsman is in working position, thus saving time and eliminating the necessity of working in cramped or inconvenient positions.

Reisinger Quick Adjustable Hollow-Mill

The Reisinger Quick Adjustable Hollow-Mill, shown in the illustration, is now being marketed by Ogden R. Adams, 407 Cutler Bldg., Rochester, N. Y. This tool is particularly adaptable for use in finishing round parts on castings or forgings, or for bar stock, and can be obtained to cover a range of



Reisinger Adjustable Hollow-Mill

sizes from 3/32 to 2½ inches inclusive.

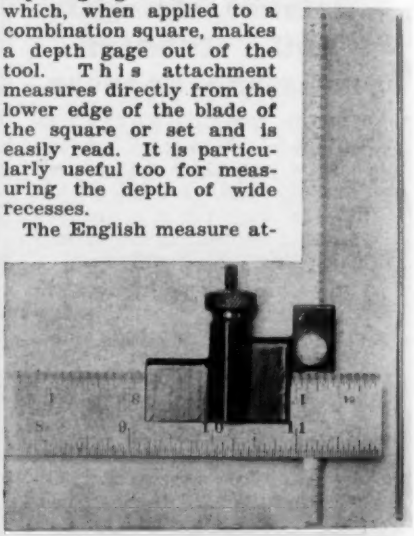
Each tool is made with four blades, controlled by an adjusting dial which is graduated in 1/000 in. A single move of a lever operates the clamping device by which all blades are locked or released instantaneously. The high speed steel blades are of simple design and can be easily replaced and economically. The tools can be adapted for use on any kind of machine, as the threaded section in the body will take shanks of any diameter, taper or design. A clearance hole is provided through the body and shank, so that cuts of any length on bar stock can be taken. Each size of hollow-mill covers a wide range, a set of six tools covering the entire range up to 2½ inches.

All parts are interchangeable and high speed cutters, straight and taper shanks, and re-sharpening fixtures are carried in stock at all times.

B. S. No. 468 Depth Gage Attachment

The Brown & Sharpe Manfg. Co., Providence, R. I., is now putting out a depth gage attachment which, when applied to a combination square, makes a depth gage out of the tool. This attachment measures directly from the lower edge of the blade of the square or set and is easily read. It is particularly useful too for measuring the depth of wide recesses.

The English measure at-



B. & S. No. 468 Depth Gage Attachment

tachment has a range of 0 to 4½ in. with a 6-in. blade which is graduated in 32nds and 64ths, or 64ths and 100ths. The former is furnished unless otherwise

specified. The Metric measure attachment has a range of from 0 to 114 m/m with 15 c/m blade graduated in m/m's and ½ m/m's. A rod that is 5/64 in. in diameter is furnished for use in small holes. The No. 468 may be used on B. & S. 9-in., 12-in., 18-in. and 23-in. combination squares and sets, but cannot be used on squares with heavy blades.

Ettco Hand-Operated Chuck for Portable Drills

A chuck especially designed for use with portable electric or pneumatic drills, the outstanding feature of which is that the chuck is operated entirely by hand without the use of a wrench, has been placed on the market by the Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn, N. Y. The wrench is opened by turning it to the left by hand and need be tightened only enough to hold the drill. The pressure applied as the drill enters the work serves to tighten the drill in the chuck. To release the drill, it is necessary only to strike a glancing blow on the side of the chuck with the palm of the hand.

The chuck is made with three jaws which are a sliding fit in a bored nose that screws into the chuck sleeve. The jaws are attached to a ball bearing thrust assembly which screws up and down on the threads of the chuck sleeve at the opposite end from the nose. All of these parts are mounted on and revolve around a driver that is fastened to the spindle of the portable drill on which the chuck is to be used. The square section of the driver fits loosely into the screw of the thrust assembly. By turning the body of the chuck about the driver and this screw, the thrust assembly is caused to travel up or down and the jaws to open or close.

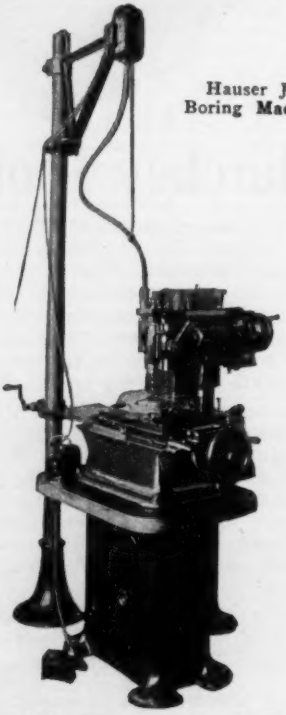
Ettco Hand-Operated Chuck

The chuck is so constructed that there is a floating action between the parts and binding or wedging within the chuck is prevented. No sharp jaws are used; the jaws may be round, and wear, as it smooths the operating parts, actually improves the efficiency of the tool. The chuck centers the drill perfectly, the

simplicity of the parts making possible a high degree of accuracy. The outer parts of the chuck are made from .40 carbon high manganese steel, and the inner parts are .20 carbon high manganese steel, carbonized, heat treated and hardened. The jaws are of special oil hardening alloy steel. All parts are interchangeable.

Hauser Jig Boring Machine

The Index Machinery Corporation, 49 Central Avenue, Cincinnati, Ohio, is now marketing a machine that is designed for fine boring operations on jigs and fixtures, known as the Hauser Jig Boring Machine. The capacity of the machine is 8 x 12 in., and the working surface of the table is 9⅞ x 17½ in. The slides are operated by micrometer screws, the drums of which are divided into hundredths while verniers furnish readings to .0001 inch. The micrometer screws undergo a thermal treatment which renders them proof against secular change. Any inaccuracies that exist



Hauser Jig Boring Machine

are eliminated by an automatic corrector, and this corrector will also correct any inaccuracy that may arise from wear.

The drums are adjustable on the screws so that they can be set to zero at the start of the work. The screws mounted in the slides are completely covered and are thus protected against dust or accident. End play is eliminated by the use of counterweights. When the machine is not in use these counterweights are released by shifting a lever, thus taking all strain off the mechanism. The micrometer screws are carried in hardened steel bushings and are hardened where they rotate in these bushings. When the machine is in operation these screws are not in use.

The drilling spindle has a vertical travel of 2¾ inches, and holes up to ¾ in. diameter can be bored with utmost accuracy. A circular table of 11 in. diameter and graduated in half-degrees is also furnished, a vernier that is moveable in either direction being employed in setting.

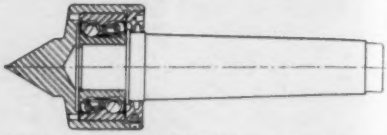
The machine can be used for center punching as well as drilling, the holder for the punching device and microscope being adjusted vertically by rack and pinion. The boring tool and tool holder are co-axial. The locating microscope which is used for measuring magnifies 30 times. The microscope used for angle measurements magnifies 20 times. Its ocular has a revolving and a fixed thread, a graduated circle and vernier providing readings in two minutes. The center punch device is controlled by a weight returning it to position after punching. The machine is driven by a variable speed motor through a flexible shaft suspended above the machine.

Ready Tool Co. Ball-Bearing Live Center

The heavy cuts which are possible with the new alloy tools have created a demand for anti-friction bearings wherever such bearings can be used. To aid in meeting this demand, the Ready Tool Co., 550 Iranistan Avenue, Bridgeport, Conn., has brought out the ball-bearing live tailstock center shown in the illustration. The outstanding feature of this center is the angular contact bearing in which high carbon

chrome steel races are so assembled that the two rows of balls are opposed in a definitely preloaded condition, affording a rigid and accurate support under all load and speed conditions.

The design of the center is said to reduce chatter to the minimum, increas-

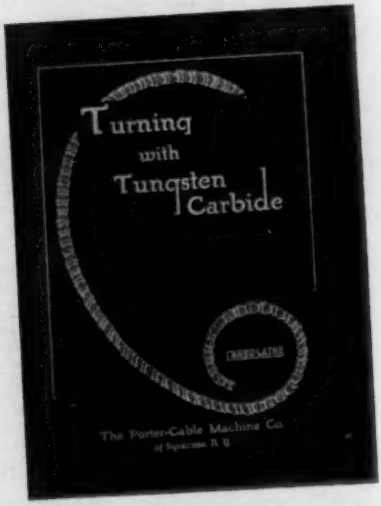


Ready Tool Co. Ball-Bearing Live Center

ing the life of the tools. This center also permits the work to be brought close to the tailstock proper, eliminating deflection or "spring." As the nose or point of the center is ground after assembly, it runs dead true. The bearing used in this center requires no attention to lubrication or adjustment of any kind. The center is made to standard tapers and sizes, but any type or size of taper can be supplied.

Turning With Tungsten Carbide

The subject of Tungsten Carbide, its properties, characteristics, uses, clearance angles, and so on are discussed in



a book which has been published by The Porter-Cable Machine Co., 300 Wolf St., Syracuse, N. Y. The book is illustrated

with drawings showing the correct clearance, rake, and angles at which the tools should be ground. It also includes a complete description of the "Carbo-Lathe"—a machine that has been designed by this company especially for use with tungsten carbide tools. A copy will be sent to any machine shop executive without charge.

Diamond Boring Tool Data

The Automatic Machine Co., Bridgeport, Conn., is now publishing a series of Engineering Data Bulletins on diamond tool boring, each bulletin describing and illustrating the use of diamond boring tools on one type of job or operation. Each bulletin carries a photograph of the job, a cross-section drawing showing the application of the tool, data as to sizes, lengths of cut, speeds, feeds, limits, and time, and a description of the job together with the results obtained. The information is clear and concise, and this set of bulletins should give anyone interested a clear idea of the uses and possibilities of the diamond boring tool.

The bulletins are in loose-leaf form, and a binder will be furnished for filing the bulletins as they are published each month. These bulletins will be sent without charge to readers of MODERN MACHINE SHOP.

"Hascrome" Welding Rod

The Haynes Stellite Company, Kokomo, Indiana, has placed on the market a manganese-chrome-iron welding rod called by the trade name of "Hascrome." The rod is composed of a self-hardening alloy, designed primarily for building up badly-worn parts preparatory to surfacing them with Haynes Stellite, which is also supplied in the form of welding rod. Hascrome may

be obtained in rods ¼-in. in diameter and 36 in. long, packed in bundles of 50 pounds each.

Centerless Grinder Data Book

Production executives who are interested in the possibilities of centerless grinding will now be able to familiarize themselves with this subject through the medium of a book that has been published by Cincinnati Grinders, Inc., Cincinnati, Ohio. This "Centerless Grinder Data Book" is divided into ten sections in which all of the various classes of centerless grinding are discussed. The subject matter is divided as follows: Introduction; Principles of Centerless Grinding, Methods of Centerless Grinding; Production Estimates on Centerless Grinding; Classes of Cylindrical Grinding; Short Cylindrical Class; Medium and Long Bar Class; Disc Class; Plain In-Feed Class; Outboard Support Class; Automatic Class; Multiple Diameter Class; Form Grinding Class; Out-Balance-Work Class; Concentric Grinding Class. The book is well illustrated and should give any reader a clear idea of what can be accomplished by this method of finishing metal parts. The price is $1.50.

For Your Catalog Library

Check any of these useful publications that you want, write your name, firm name, title, and address on the margin, then tear out the page and send to Modern Machine Shop, 128 Opera Place, Cincinnati, Ohio. They will be forwarded to you promptly without cost or obligation. Please restrict your list to not more than ten.

Abrasive Grinding Wheels: The types of wheels, with recommended grades and grains, which should be used for each of the various kinds of grinds are discussed in a booklet which will be sent free to mechanical executives by the Abrasive Company, Philadelphia, Pa.

Hollow-Milling: How production can be increased and costs lowered by the use of adjustable hollow-mills with high speed blades and interchangeable shanks is told in a bulletin that has been issued by Ogden R. Adams, 407 Cutler Bldg., Rochester, N. Y. Copy free upon request.

Broaching By Modern Methods: Equipment and tools for finishing round, square or irregular-shaped holes and surfaces by broaching are described and illustrated in a booklet that is issued free by the American Broach & Machine Co., Ann Arbor, Michigan.

Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Metal and Wood Saws: Catalog No. 20 describing saws of all kinds, for both metal and wood. 256 pages of descriptions of saws and sawing machinery. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Geared Drilling and Tapping Machines: A catalog describing in detail the various types of all-geared, self-oiling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

"C-V" Chrome Vanadium Wrenches: A complete line of wrenches made of Chrome Vanadium steel—practically unbreakable—is described in a booklet that has been issued by the Bonney Forge & Tool Works, Allentown, Pa. Copy free upon request.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-geared and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

How to Sharpen Cutters: A series of leaflets, which describe and illustrate the correct methods to employ in sharpening all kinds of cutters, can be obtained, without charge, by addressing Brown & Sharpe Mfg. Co., Providence, R. I.

Sheet Metal Problems: The use of the nibbling machine for cutting sheet metal stock is discussed in a booklet which can be had without charge by addressing Andrew C. Campbell, Inc., Bridgeport, Conn.

High Speed Drill Presses: A complete line of drill presses that can be run at high speeds with complete safety is described in catalog number 50, issued by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill. This catalog also contains descriptions of other equipment manufactured by this concern. Sent free upon request.

Gears Of All Kinds are described and illustrated, with specifications, in Catalog 80, which has been issued by the Chicago Gear Works, 105-9 S. Jefferson St., Chicago, Ill.

Gear Data: The Cincinnati Gear Co., Cincinnati, Ohio, has published Catalog D, which describes and illustrates the various types and kinds of gears made by this firm. The book contains photographs of the plant departments, with descriptions of the equipment employed, and also includes a number of pages of valuable data and reference tables for machine shop use.

Grinding the Centerless Way: The advantages of the centerless grinding method is discussed in a booklet which also describes the centerless grinding machines made by Cincinnati Grinders, Inc., Cincinnati, Ohio. The illustrations show various types of jobs in process, and full data is included. Copy free upon request.

Cincinnati Hydromatics With Locked Hydraulic Feed is the title of a book that describes in detail the new type of automatic milling machine with hydraulic feed which has been developed by The Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio. Copy free to any machine shop executive.

Rapid Traverse Planers: Cincinnati Hypro Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

A Treatise on Shaper Design, illustrating the features that are to be found in the new Cincinnati Rapid Traverse Shapers and describing the shapers that are made by this firm, will be sent free to any mechanical executive by the Cincinnati Shaper Co., Dept. MM, Cincinnati, Ohio.

OTHER PUBLICATIONS LISTED ON PAGES 106, 108, AND 110.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Columbia Superior Shapers: Bulletin No. 17, issued by The Columbia Machine Tool Co., Hamilton, Ohio, describes and illustrates the line of heavy duty shapers made by this firm. Copy free upon request.

Broaching for Profit: A combination round and spline broach which broaches the drilled hole to size, cuts the splines, and removes the burrs in one operation is described in a circular which will be sent free by The Connecticut Broach & Machine Co., New London, Conn.

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Make Better Dies: Better work can be produced, and in less time, if the die can be held in the most convenient position. A universal die-holding stand which can be quickly adjusted to hold a die at any height or angle is described in a catalog which can be obtained by addressing Davenport Locomotive & Mfg. Corpn., Dept. M, Davenport, Iowa.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Quantity Drilling: A semi-automatic multiple spindle drilling machine which is designed to produce the maximum of drilled holes in medium or small parts, is described in a pamphlet that is published by the Detroit Machine Tool Co., 5055 Woodward Ave., Detroit, Michigan. Sent free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Economy in the Drafting Room: A drafting table which can be adjusted, by means of a foot-lever, to any height or angle most convenient, is described in a folder that can be obtained without charge by addressing the Equipment and Supply Company, 51 Madison Avenue, New York.

Economy in Tapping: The Ettco Tapping Attachment, in which sensitiveness is combined with high speed, is described in a folder which can be obtained without charge by addressing the Eastern Tube & Tool Co., 596 Johnson Ave., Brooklyn, N. Y.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

Gear Tooth Shapes: A study of the fundamental principles of involute gearing and treatise on the development of the standard tooth form are contained in "Gear Tooth Shapes," published by The Fellows Gear Shaper Co., 78 River St., Springfield, Vt. Copy free upon request.

Production of Metal Stampings: The Ferracute Machine Co., Bridgeton, N. J., is publishing a booklet which describes and illustrates the most modern equipment for the production of metal stampings. Copy free upon request.

Silent, Self-Lubricating Gears for use in all kinds of machines are described in a booklet that can be had upon application to Fibroc Insulation Company, Valparaiso, Indiana.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

"Non-Clog" Coolant Pumps are described and illustrated in a booklet which has been issued by the Fulflo Specialties Co., Blanchester, Ohio. Copy free upon request.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Gallmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

Flat Surface Grinding: Automatic, semi-automatic, and single-purpose machines for performing all kinds of grinding operations on flat surfaces are described and illustrated in a book that has been issued by the Gardner Machine Company, Beloit, Wis. Copy free upon application.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y., Copy free upon request.

Air Is Your Best Helper: Air will operate your presses, chucks, vise jaws, and other tools more efficiently and at less cost. Catalog MS-11, issued by the Hannifin Mfg. Co., 621-631 S. Kolmar Ave., Chicago, Ill., will show you how it is done. Ask for a copy.

Drilling and Grinding Electrically: Catalog M, showing and describing a variety of modern electric portable drills, grinders, and other tools, including floor grinders and buffers, has been issued by The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, Ohio.

Internal Grinding Equipment: The latest equipment for grinding holes of all sizes, from small wrist pin holes to the holes in locomotive cylinders, is described and illustrated in a booklet that will be sent free by the Hutto Engineering Co., Inc., 542 Lacaste Ave., Detroit, Michigan.

"Excel" Precision Filing and Sawing Machine: A filing and sawing machine for use in producing templets, dies and other irregular-shaped parts is described

OTHER PUBLICATIONS LISTED ON PAGES 104, 108, AND 110.

and illustrated in a booklet which is issued free by the Index Machinery Corporation, 49 Central Ave., Cincinnati, Ohio.

"Do It Electrically": The complete line of "Thor" universal electric tools, including tools for drilling, reaming, screw-driving, tapping, nut-setting, grinding, and for performing other operations is described in Catalog No. 17, issued free by the Independent Pneumatic Tool Co., 236 S. Jefferson St., Chicago, Ill.

Special Mil-Waukee-Mills of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Koebel-Wagner Diamonds for Wheel Dressing: The Koebel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koebel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

Lathe Dogs and C Clamps are described and illustrated in Catalog No. 80, issued by the W. G. LeCount Tool Works, South Norwalk, Conn. Copy free upon request.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Punching and Shearing Operations: A complete line of machines for perforating and cutting metal in practically any size and shape is described and illustrated in a booklet which has been issued by The Long & Allstatter Co., Hamilton, Ohio. Copy free upon request.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

Maydole Hammers: All the various types and kinds of hammers made by this 87-year-old firm are described and illustrated in a catalog which can be had without charge. Address The David Maydole Hammer Co., Norwich, N. Y.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

Hi-Production Counterbores: A counterbore of simple yet highly efficient construction, with positive drive, rigidity, and a number of other features is described in a circular which will be sent free upon request. Address Morse Counterbore & Tool Co., 12281 Turner Ave., Detroit, Mich.

Automatic Tapping and Threading Tools of the latest types and designs are illustrated and described in Catalog No. 25, which has been issued by the Murchey Machine & Tool Co., 951 Porter St., Detroit, Mich. Copy free upon request.

Natco Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Natco" multiple drilling and tapping machines.

Milling Internal Keyways: A simple method of milling keyways in gears, wheel hubs, and other similar parts with the aid of a drill press and a special tool is explained in a booklet that is published by the National Machine Tool Co., 2271 Spring Grove Ave., Cincinnati, Ohio.

Double Year Cutter Service: Milling cutters, reamers, and other tools can be recut at a saving of from 20 to 60 per cent by the National Tool Salvage Co., 3840 Beaubien St., Detroit, Mich. Circular upon request.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work, is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

Grinding Wheel Information: A booklet which tells how grinding wheels are made and graded, and which give instructions for mounting wheels, operating speeds for different kinds of work, instructions for truing and dressing, and other information has been issued by the Norton Company, Worcester, Mass. Sent free upon request.

Correct Cutter and Tool Grinding: Grinder Booklet "E," which is illustrated with 48 photographs, tells hwo to grind tools correctly and economically. It shows how a solid-backed cutting edge reduces cutter costs and increases production per grind. A copy will be sent free by addressing The Oesterlein Machine Company, 3301 Colerain Avenue, Cincinnati, O.

Speed Reducers: Speed Reducers to obtain any desired reduction up to 24,000 to 1 are described and illustrated in Catalog 29-A, issued by The Ohio Gear Co., 1335 East 179th St., Cleveland, O. Copy free upon request.

Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

Self-Tapping Sheet Metal Screws: Screws which are threaded and hardened in such a manner as to enable them to cut their own threads as they are screwed into sheet metal assemblies are described in a folder which is published by the Parker-Kalon Corporation, 192-196 Varick St,. New York City., N. Y. Sent free upon request.

"Turning With Tungsten Carbide" is the name of a book that has bene issued by The Porter-Cable Machine Co., 300 Wolf St., Syracuse, N. Y. This book answers the most important questions as to the uses of this new cutting alloy, and also describes a new lathe which has been developed especially for use with tungsten carbide tools. Copy free upon application.

Powell "Bio-Gun" Air Valves: Air is faster and more efficient than a brush for cleaning machines tables. The use of the Powell Bio-Gun for this purpose is discussed in a catalog that can be obtained by addressing The Wm. Powell Co., Cincinnati, O.

Tapping Devices, Quick-Change Chucks, Stud-Setting Tools and Bench Tappers: A catalog describing the various types and kinds of tapping, drilling, and stud-setting devices manufactured by the Procunier Safety Chuck Company, 12 South Clinton Street, Chicago, Ill., can be obtained without charge by addressing this company. The catalog also tells the part that Procunier tools play in obtaining greater accuracy and less tap breakage.

Engine, Turret, and Gap Lathes are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2935 Spring Grove Ave., Cincinnati, Ohio.

OTHER PUBLICATIONS LISTED ON PAGES 104, 106, AND 110.

Pullmore Industrial Clutch: A multiple disc clutch, made in two types, to run in oil or dry, and which is so built that it can be operated at high speeds, is illustrated and described in a folder that will be sent free by the Rockford Drilling Machine Company, Rockford, Ill.

Universal Openside Shaper-Planer: The need of a machine tool to fill the gap between the shaper and the planer has been filled by the development of the Rockford Universal Openside Shaper-Planer, made by the Rockford Machine Tool Co., 2414 Kishwaukee Ave., Rockford, Ill. Full description on request.

Automatic Lubrication: Individually motor-driven pumps that keep the work flooded with lubricant are described in a booklet that has been published by the Ruthman Machinery Co., Front and Pike Sts., Cincinnati, Ohio.

Safety Grinding Wheels: The complete line of grinding wheels made by the Safety Grinding Wheel & Machine Co., Springfield, Ohio, is described in Catalog No. 11, which is issued by this firm. The book also contains instructions for operating grinding wheels, tables of grinding wheel speeds, pulley calculations, and other information for the user of grinding wheels.

Saving Time With Small Tools: A line of time-saving small tools, including "Use-'Em-Up" drill sleeve, "Wear-ever" chucks, collets, cutters, reamers and tap holders, counterbores, spotfacers, and other tools is described in Catalog 36, issued by Scully-Jones & Co., 1909 S. Rockwell St., Chicago, Ill.

Equipment For the Shop: Vises for the bench, drill press, milling machine or shaper; angle plates; adjustable clamps, jacks and other tools for the machine shop, are described and illustrated in a booklet that is published by the Sheldon Machine Co., 3253-55 Cottage Grove Ave., Chicago, Ill. Copy free upon request.

Rapid Drill Jigs: How time can be saved and drilling operations made easier by the use of a quick-acting drill jig is told in a booklet that is issued free by the Siewek Tool & Die Co., 10230 Woodward Ave., Detroit, Michigan.

"Metal Cutting" is the title of the book that describes the latest methods of cutting metals, and includes descriptions and illustrations of both the band saws and inserted-tooth metal-cutting saws made by the Simonds Saws & Steel Co., Fitchburg, Mass. Copy will be sent free upon application to the firm mentioned.

Shaping with Modern Equipment: The Smith & Mills Company, 2889-91 Spring Grove Avenue, Cincinnati, Ohio, has issued a booklet which describes and illustrates the line of modern shaping equipment made by this firm. Copy free upon request.

Machinists' Tools and Gages: Catalog No. 24, issued by the L. S. Starrett Co., Athol, Mass., describes and illustrates the complete assortment of machinists' fine tools and gages made by this firm. Copy free upon request.

Engineering and Manufacturing Service: A complete engineering and manufacturing service for manufacturers who are not equipped to handle all of their own designing, experimental, or production work is described, with illustrations of the equipment available, in a bulletin that is issued by The Steel Products Engineering Co., Springfield, Ohio.

Flexible Shaft Equipment: The uses of the flexible shaft for drilling, grinding, and other operations is discussed in a booklet which also describes and illustrates the flexible shaft equipment made by N. A. Strand & Co., 5001 N. Lincoln St., Chicago, Ill.

Cutting Oil Data: A series of booklets containing valuable information about cutting oils and their uses for thread-cutting, broaching, and general cutting purposes will be sent free to any mechanical executive by D. A. Stuart & Co., 2727 South Troy St., Chicago, Illinois.

Rigidmilling Principles and Practice: A book that shows how the Rigidmil can be adapted to various kinds of usual and unusual milling operations, and which describes in detail the work that can be handled by this machine has been issued by the Sundstrand Machine Tool Co., Rockford, Ill. Copy free upon request.

Cutting and Grinding Fasts: A discussion of cutting oils and lubricants, together with descriptions and illustrations of various kinds of jobs upon which cutting oils are used, is contained in a booklet that is issued by the Sun Oil Company, Finance Building, Pittsburgh, Pa. Free upon request.

Quality Drilling Machines: The high-grade drilling and tapping machines made by the Superior Machine Tool Co., P. O. Box 376, Kokomo, Ind., are described and illustrated in a booklet that will be sent free upon application to this firm.

Precision Measuring Instruments: The gages, micrometers, and other precision measuring instruments made by the Swedish Gage Co. of America, 7310 Woodward Ave., Detroit, Mich., are fully described in an interesting booklet that has been published by this firm. Copy free upon request.

Save Cutting Oil: How cutting oil can be separated from chips and thus reclaimed by the use of a centrifugal chip "wringer," is told in a bulletin that is issued free by the Tolhurst Machine Works, Troy, N. Y.

Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

A Simplified and Improved Drive Control for Machinery: Two distinct types of plate clutches that have proved successful highly in the driving mechanism of machine tools are described and illustrated in a bulletin that will be sent free by the Twin Disc Clutch Company, Racine, Wis.

Powerful, Easy-Acting Chain Hoists of the most modern design are described and illustrated in a booklet that is issued by the Union Manufacturing Co., 296 Church St., New Britain, Conn. Copy free upon request.

Multiple Drilling With a Single-Spindle Drill: Methods by which multiple drilling may be done on a single-spindle drill, using multiple spindle drill heads, are discussed in a bulletin that is issued by The United States Drill Head Co., 1954 Riverside Drive, Cincinnati.

Electrically-Driven Portable Tools: The "U. S." line of electric drills, die grinders, electric screw drivers, surface grinders, tool post grinders, and bench and floor grinders is described in Catalog No. 24, which has been published by The United States Electrical Tool Co., 2471 W. Sixth St., Cincinnati, Ohio.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

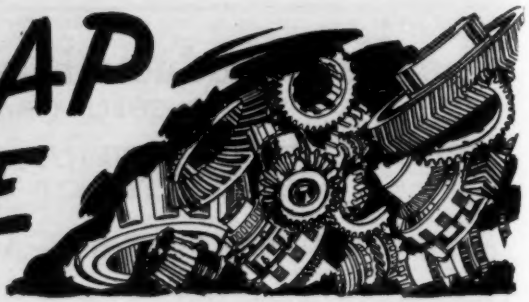
"Wedge-Lock" Multiple Bit Tool Holder: A new type of tool holder, in which the tool bit is held by the action of a wedge, is described in a bulletin which will be sent free upon request by the Wedge-Lock Tool Co., 549 W. Randolph St., Chicago, Ill.

Shop Furniture: A catalog describing and illustrating all kinds of shop furniture, including benches, vises, steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Springfield, Ohio.

Hardness-Testing With Accuracy and Speed: The principles of testing for hardness by the use of the Rockwell Hardness Tester are discussed in a booklet which also shows a number of applications of this instrument, published by the Wilson-Maeulen Co., Concord Ave. and 143rd St., New York, N. Y. Sent free upon request.

OTHER PUBLICATIONS LISTED ON PAGES 104, 106, AND 108.

THE SCRAP PILE



By GEO. ALEXANDER MANN

One On Dad

The joke's on poor ol' Dad—
He sure brot on a riot—
He brot home a horn an' drum—
To keep the darn kid quiet.

Herb's big problem is to make picks and shovels look more like niblicks and brassies.

Ain't Ut Tha Troof?

The noiseless typewriters are not going to cut down the office clatter much if the stenogs are going to continue to chew gum.

Poor Tom

For Xmas Tom got
Poor hapless Turk,
A wife and lighter,
An' neither work.

The average woman is satisfied with a 50-50 break—providin' she gets both parts of it.

Why—The Pert Thing

"Is my nose shiny, dear?"
Asked Louise Von Gusty;
Her steady answered, "No,
But your right knee's dusty."

Much To Be Preferred

The more we hear o' what's bein' broadcast these days, the more we feel like askin' the dealer to return our old set so we can go back to static.

Love is never so blind that it can't find the switch to turn off the porch light.

Oh—That's It

"I don't remember you,"
Said old barber Strupp—
"No," said the victim;
"My face is healed up."

One o' the best golf tales we've heard recently is the one about two golf hounds meeting, and upon one asking the other if he'd heard about McPherson beating his wife to death with a golf club, the other hound came back with: "No, how many strokes?"

Atta Boy—Capt.

"The enemy are thick as peas,
What shall we do?" cried Pellham.
Whereupon the captain yowled:
"Shell 'em, idiot; shell 'em".

Troo Enuff

Maw says "Wimmin go through a lot." Paw says, "Yes—of pockets."

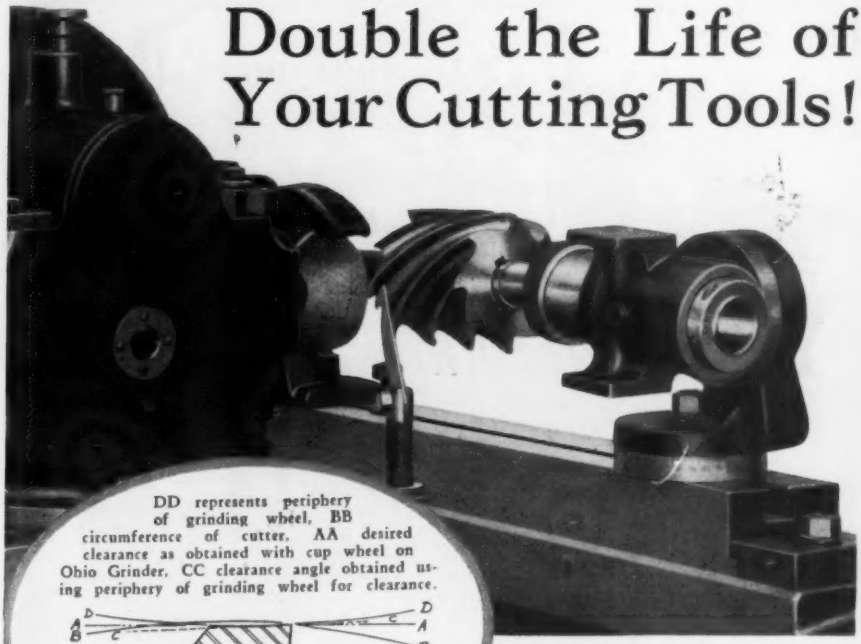
Paw says people don't know what happiness means until they get married—then it's too late.

Musta Been Turrible

"Wuz it a neckin' party?
Huh," said Tillie Gartner,
"Why, before each dance they yelled,
'Each one chews his partner'."

Index to Advertisements

Double the Life of Your Cutting Tools!



Above—Coarse Tooth Spiral Mill set-up with underslung tooth rest. Left—Illustrating the difference between Oesterlein-Ohio method and other methods of grinding.

KEEPING your cutting tools in service twice as long is only a matter of proper grinding.

Oesterlein-Ohio Grinders properly grind cutting tools through the use of a cup-shaped wheel, which grinds a straight-line clearance that results in a solid-backed cutting edge. Such an edge lasts much longer than an undercut edge.

An outstanding feature of this machine is the ease with which the cup-shaped wheel may be applied to any type of cutting tool.

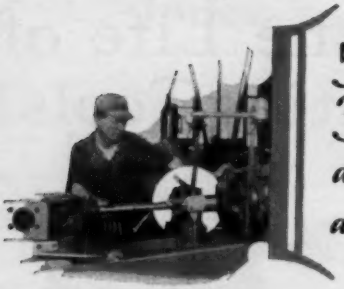
Rigid construction—all bearings and wearing surfaces protected from dust—automatic lubrication—dual control—two rates of table traverse—quick set-up on all types of cutters—these are a few of the features which make the Oesterlein-Ohio Grinder the ideal grinder for your tool room.

Our new illustrated booklet is yours for the asking.

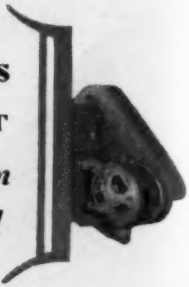
MAIL COUPON TODAY!

THE OESTERLEIN MACHINE CO., Cincinnati, O.
Please send me one of your new illustrated grinder booklets.
Name.....
Firm.....
Address.....
City.....
State.....

OESTERLEIN OHIO
MILLING
GRINDING DRILLING
EQUIPMENT



50% MORE HOLES
32% LOWER COST
drilling High Carbon and Molybdenum Steel



Yes . . drills have been improved

—Perhaps even more than you realize.

A large oil well tool manufacturer, for example, was pleased to discover a drill that cut the cost of drilling nickel-molybdenum steel by 32%. Drills formerly used on this difficult job had to be reground at 15 hole intervals and were good for approximately 1500 holes at average speed. Cleveland Cle-Forge Drills lasted for 22 holes per grind, and showed a total drill life of 2200 holes, in spite of the fact that the work was frequently speeded up beyond the blue chip limit.

The superiority of Cle-Forge High Speed Drills is due to a special manufacturing process, exclusive to Cle-Forge. *Toughness* of the forged drill and *cutting accuracy* of the milled drill have been ingeniously combined to produce a tool that has repeatedly held world's records for rate of penetration.

And in numerous tests under everyday working conditions Cle-Forge Drills have shown a longer production life, greater efficiency, and lower "Cost-Per-Hole" than any other drill

On the basis of proved performance, we urge you to test Cle-Forge Drills in your plant. Less modern, less efficient drills may be adding a needless burden to your production costs. If you like, we will be pleased to mail you a copy of Digest No. 60 explaining how the "Cost-Per-Hole Test" of comparing drills has brought new drilling economy to other plants. Write for it

The CLEVELAND TWIST DRILL CO.
Cleveland, Ohio

We're interested. Please send a copy of Digest No. 60.

Name _____

Address _____

Town _____

State _____

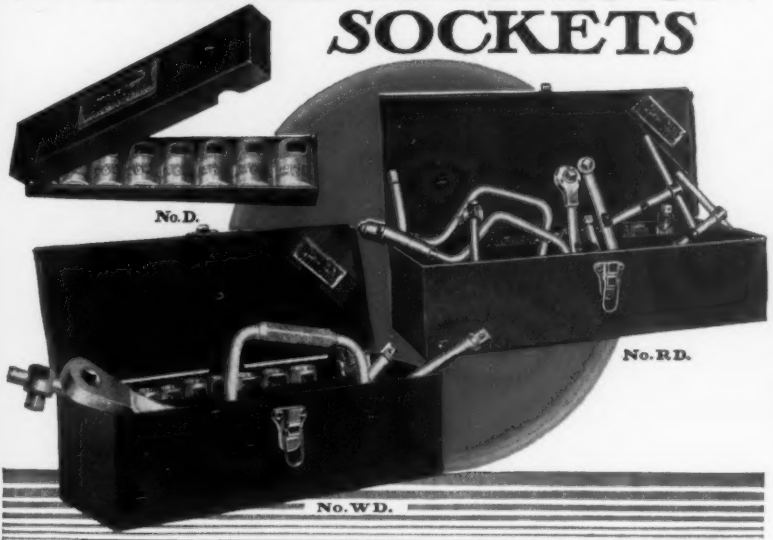
The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON
SAN FRANCISCO

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

BONNEY

*CV (Chrome-Vanadium)

DOUBLE HEXAGON SOCKETS



THE D SET is made up of 8 double hexagon sockets from 7/16″ to 13/16″ inclusive, without handles, packed in a compact enameled metal box—the set selling at $6.40.

THE RD SET is composed of 10 double hexagon sockets 7/16″ to 7/8″ inclusive, together with the following handles: Offset, Ratchet, 6-inch T, 12-inch T and Sliding T, 13-inch Brace, 20-inch Speeder, 5-inch Extension and 10-inch Extension and Universal Joint. The Set comes packed in a substantial enameled metal carrying case at $29.85.

THE WD SET consists of 10 double hexagon sockets from 7/16″ to 7/8″ inclusive, with the following handles: Ratchet, Sliding T, 13-inch Brace, 5-inch Extension, 10-inch Extension and Universal Joint. This Set is packed in a convenient enameled metal carrying case and sells at $21.00.

*CV is a Bonney trademark registered in the U. S. Patent Office

The leading Jobbers carry these wrenches in stock.

BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forge Wrenches, Pipe Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

Chrome Vanadium registered August, 11 1925

Patents Pending

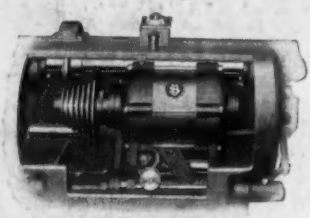
THE STANDARD OF QUALITY
SINCE 1897

4 wheel speeds!

U. S. Multispeed Buffer and Polisher

FOUR distinct spindle speeds from 2,000 to 3,000 R. P. M. with this one machine give you just the right burnishing or buffing speed for practically any job. And you can change from one speed to another in only a few seconds — by means of the convenient hand lever and foot pedal.

The Gibbs V-Disc transmission of GRAPHITIZED MICARTA gives high efficiency in power transmission at all speeds. The complete absence of slip or backlash, the convenience of the drive, the simplicity and negligible cost of replacement, and its ability to withstand hard usage, make this transmission most successful. Typical of U. S. quality throughout. Furnished for 220, 440, 550 volts, 2 or 3-phase, 25, 50 and 60-cycle alternating current. Ask your jobber or write us today for full details.



The UNITED STATES ELECTRICAL TOOL CO.

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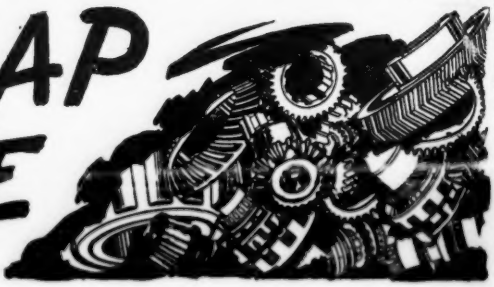

By Geo. Alexander Mann

Answer Me That

Life is a battle o' wits—
An' many go unarmed.

There's a little ask,
I must get off my chest,
What's the diff between
The worst liar and the best?

The British say that our English is terrible—Hum—They ought to sample some o' our Scotch.

Einstein's theory holds no terrors for the guy who figures out his own income tax returns.

You Know Him

There is a saleshound that we know,
His is the worst of vices.
He's got no time to shave his face,
He's busy shavin' prices.

A Dem Shame

"I've lost my taste for Clarence Dear,
He's got so elemental,
He can't kiss me a dozen times,
'Thout gettin' sentimental."

Ev'rything Else Extremely Bustable

'Twould seem that an airplane record is the only thing about the darn contraption that it's difficult to break.

Get good an' hot—faint hot ne'er won fair lady.

Poor Ol' Paw

With feetlets fulla tacks poor Paw
Enjoys bein' a daddy much.
He says that with each kid that comes,
There oughta come a crutch.

That Shot Got Him

"How much to keep you goin'
Fifty a week, Honey?"
She answered, "Fifty what,
You mean men or money?"

'Tis great to be missed—Yeh—That's why men are careful ther days to pick fraus who're rotte shots.

Then there's the man too busy preparin' for failure to be a success.

If you've got the disposition to see things that should be done and said, and the guts to do and say them, you can expect "The Do-Little and Say-Lessers" to refer to you as a flusher and a wind bag.

A Hot Tip

"I'm just a little pebble
In your life," said Johnny Holder.
She said: "I'd like you better,
If you were a little boulder."

The more credit a woman deserves the more cash she demands.